MAY 25 1936

Engineering News-Record

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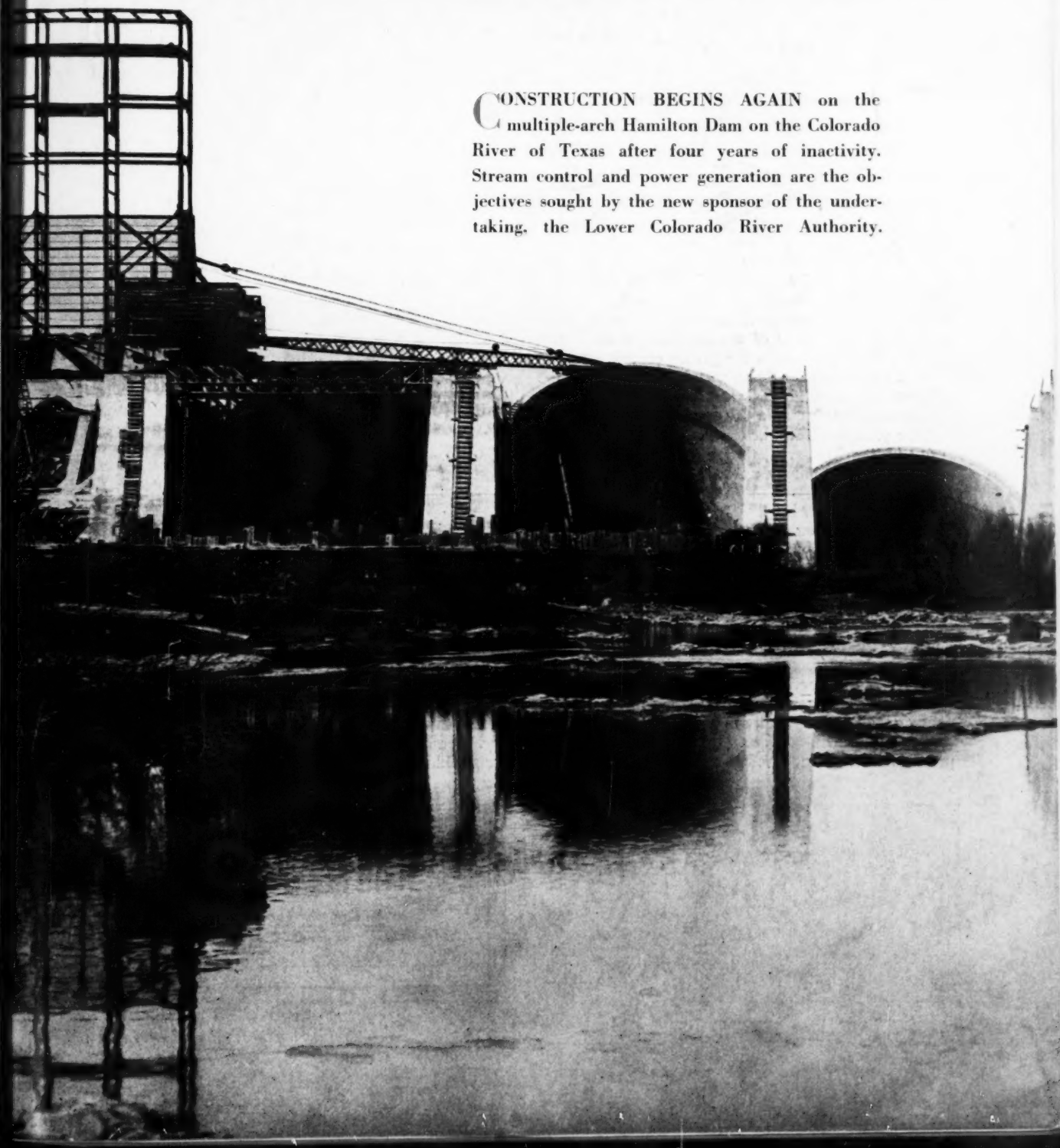

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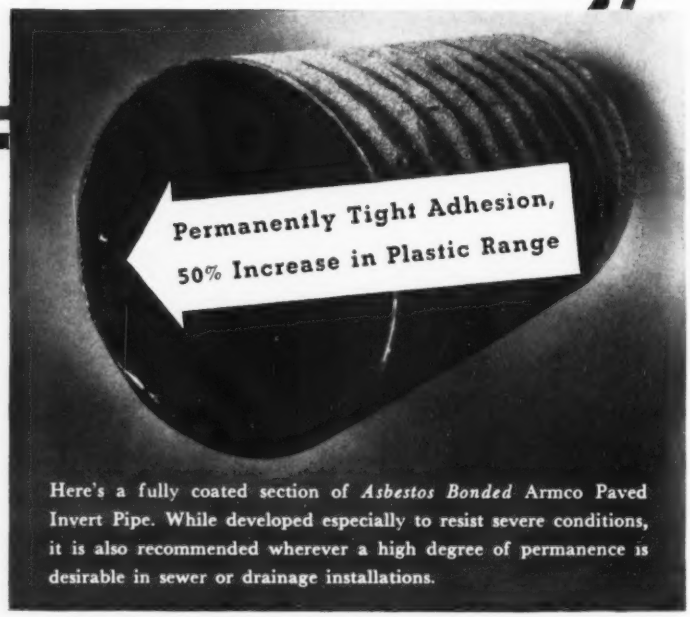

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MARKET PLACE *of the Modern World*

A FEW weeks ago this page made the point that ours is an economy of production and exchange; from which it follows that we can make consistent progress toward higher living standards only as we keep the exchange function constantly in step with production.

Obviously no useful purpose can be served by increasing productivity without a proportionate increase in the rate at which each of us can exchange what he produces for what he needs. In a specialized economy such as ours, each can benefit from his greater capacity only as he finds takers for his increased production: this implies that he will use proportionately more of whatever may be produced by others.

That is why, in this land of high productivity, the salesman and the advertising man have come to play so important a rôle. It is not because of any peculiar national psychology that the American rates salesmanship and promotion so high. He knows that, despite their occasional extravagances, these functions are just as basic and essential to our existence as is the complementary function of production.

IT must be obvious that before we can exchange the goods and services that result from our abundant productivity we first must exchange ideas about them. Gone are the days when, for most of the people, long hours of gruelling labor produced scarcely the bare necessities. Under such conditions no preliminary exchange of ideas was necessary. Wants were primitive, commodities and services were staple, choice was narrow. Trade was largely an affair of barter and of local scope. New things were rare because few could afford more than the necessities.

Then, with the coming of modern technology, each producer found his efforts more productive. And, although natural limitations may have governed the possible demand for some commodities even at lower prices, imagination and invention soon turned this surplus productive energy toward devising new products and services that might gratify desires and satisfy needs as yet unknown to most people.

So far so good. But the life-blood of production is trade; it is exchange that maintains the flow of goods and services between producers and users. And how could men be expected to seek out things they knew not of? How could they use their newly found productivity to purchase services of which they never had heard? If we were to maintain the new tempo of production made possible by technology, somehow we must broaden the horizons and stimulate the desires of all to enjoy what each now could supply from the fruits of his new productivity.

Out of this need selling and advertising were born. Their task is to make known to others what each producer has for them and to whet their appetites for it. Whether it be a motor-car, a breakfast food or a world-tour for the man or woman on Main Street, or a material, process or machine that will help the man operating a factory, office or construction job, the objective is the same. Day in and day out, selling and advertising constantly are at work telling all who should know just what others are devising, making and offering for their use.

Just as long as that process is efficiently and successfully continued we shall maintain our productivity and our standard of living; just as soon as it no longer is effective we shall begin to slip back toward more primitive standards and a more laborious existence to maintain even those. When exchange stumbles, production falters; when production falters we have less of those things which alone can make for abundant living.

THE advertising pages of this and other journals are indices of progress not just because they mean business for the publisher and the advertisers; it is because they have become the true market places of the modern world. To them come the alert and progressive producers, telling what they have to offer, and the equally alert and progressive users seeking what may be available to better their standards of living or business practice. They provide the indispensable channel through which producers can circulate that understanding of their wares which must precede any exchange of the wares themselves.

The advertising pages, weaving throughout the structure of our modern economy, are conductors for that pulsing current of understanding and demand which alone can activate the motors of production.

Willard Chevalier

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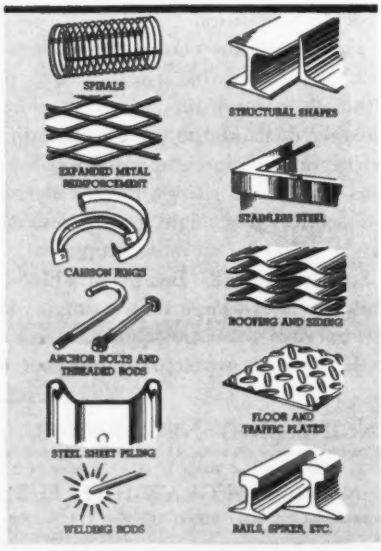

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Insurance Against Prosperity—SUCH, believe it or not—is the theme of next week's issue, our ANNUAL WATERWORKS NUMBER, for prosperity spells trouble for the inefficient water system. Articles on better pumping facilities, proven maintenance methods and modern quality control will provide the body for an effective insurance policy.

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ENGINEERING NEWS-RECORD

May 21, 1936

FIG. 1—BIO-FILTER experimental plant at Salinas, Calif., employing two-stage treatment. The coarse rock filter is at the right and the secondary fine rock filter is at the left. In the background are the combined detention-settling tanks.

Bio-Filtration of Sewage

The theory and practical application of a method of sewage treatment combining basic characteristics of the trickling filter and the activated sludge process

By Harry N. Jenks
Consulting Sanitary Engineer
Berkeley, California

THE desirability of avoiding the shortcomings of the trickling filter without resorting to the activated sludge process, which in turn has limitations of its own, has prompted the writer, for some years past, to seek the improvement of the trickling filter in the biologic treatment of sewages and industrial wastes.

Extensive experimental studies conducted with this purpose in view have led to the initial development of a process of bio-filtration that appears to combine characteristic advantages of the trickling filter and the activated sludge process, and at the same time to avoid the more serious limitations of either method alone. This merging of the processes is the outcome of introducing the principle of recirculation in the operation of the trickling filter, which involves the repeated passage of the filter effluent through a rock bed of greatly reduced volume in contrast to allowing the applied sewage to percolate but once through the relatively large volume of rock in the conventional trickling filter.

THE TERM "BIO-FILTRATION" designates the principle of repeatedly passing sewage at high rates of application through a small volume of rock filter medium. This new procedure in treatment methods is in striking contrast to the operation of a conventional trickling filter in which sewage percolates but once through a large volume of broken rock. The application of the principle of recirculation to filtration results in a process of biological oxidation that appears to combine in a single form of treatment the advantages of the activated sludge process and those of the trickling filter. This article, outlining the engineering elements of bio-filtration, is based on investigations made at two experimental plants designed by the author. A 1-m.g.d. plant is now being built at the Camarillo state hospital in California.

—EDITOR.

It is believed that the advantages of bio-filtration are capable of significant further development and of broad application in the design of sewage treatment works.

Basic elements of the bio-filter

The general arrangement of structures for typical bio-filtration installations are illustrated diagrammatically in Fig. 2. These relate to single-stage and two-stage complete treatment, and to single-stage intermediate treatment of sewage as ordinarily required in practice. Preliminary treatment facilities, such as screens, etc., are not shown nor do these plant layouts indicate any means for the handling of sludge.

The engineering design of the treatment works follows accepted procedure in respect to all major structural and equipment elements. The detention tank, provided with continuous sludge removal equipment, may be of either the circular or rectangular type. The design of the bio-filter is similar to that of the trickling filter, and involves the use of a rotary distributor, or a system of low-head spray nozzles for the continuous application of the recirculated flow. Finally, the requirements of recirculation entail low-head pumping equipment of relatively high capacity, characteristic of the screw or propeller-type pump, of which several standard makes are available.

Primary Settling Tank—When a primary settling tank is provided as a sepa-

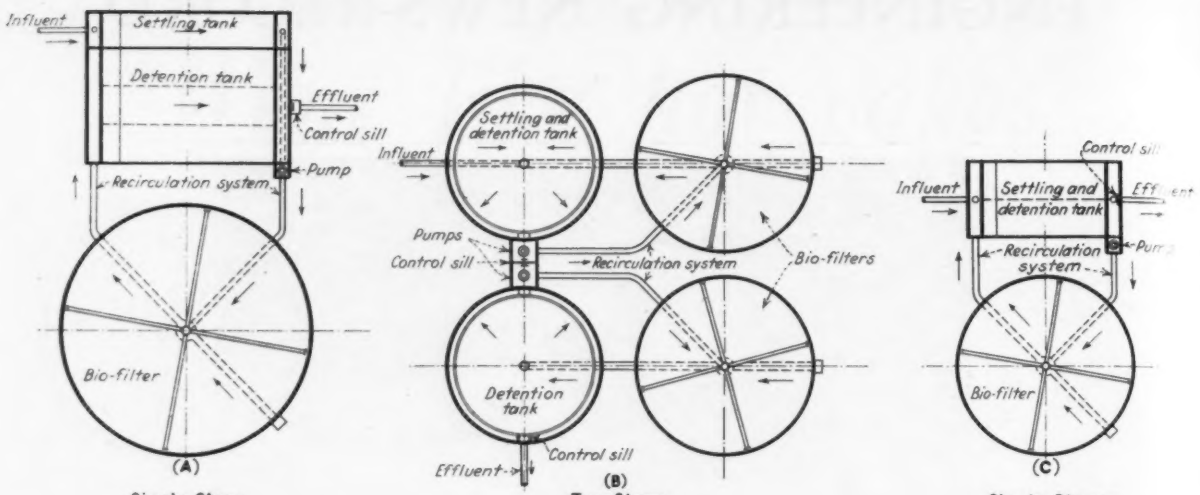


FIG. 2—ARRANGEMENT of structures for typical bio-filtration installations.

rate structure (Fig. 2-A) it is designed in the usual manner; otherwise it is combined with the detention tank (Figs. 2-B and 2-C). This detention tank, in addition to retaining the sewage flow in the plant for the required period of treatment, also includes the added function of sedimentation of sludge originating within the system. Thus it serves as an intermediate or a final settling tank. As noted from Figs. 2-B and 2-C, it is advantageous in certain instances to make the detention tank fulfill also the function of primary sedimentation.

The volumetric capacity of the tank in relation to detention is computed on the basis of the sewage flow, *Q*. The tank area and proportions for effective period of sedimentation, S, are based on the flow of recirculation, Re. The detention period in hours is called D.

Experiments indicate that for the ordinary proportion of $S/D = Q/Re$, the value of S lies between 1.0 and 1.5 hr. Satisfactory removal of suspended solids will normally occur above a minimum value of $S = 1.0$ hr., provided the area factor of sedimentation is sufficiently high, i.e., not less than 1 sq.ft. per g.p.m., equivalent to a settling rate of 1,440 g.p.d. per sq.ft.

Recirculation System—This comprises the pumps and pipework by means of which a flow of recirculation is maintained between the detention tank and the bio-filter. The flow of recirculation is the quantity of liquid actually pumped through the system, the sequence of flow being either: (1) pumping from the detention tank onto the bio-filter, with gravity return to the detention tank; or (2) gravity flow from the detention tank onto the bio-filter, with pumped return to the detention tank.

The flow of sewage itself proceeds in the normal manner from the influent end to the effluent end of the plant, except that as the sewage traverses the detention tank it is successively withdrawn from and returned to this tank and subjected to repeated applications to the bio-filter bed within the recirculation system. The flow of recirculation is maintained concomitantly with, but independently of, the sewage flow.

In general, the rate of pumpage will be greater than that of the sewage flow, and the total pumping head will be limited to about 7 ft. (with a 3-ft. depth of bio-filter bed). In cases where the pumpage equals the sewage flow, the material applied to the bio-filter comprises the sewage alone, the recirculation, as such, being equal to zero.

The Bio-Filter—This element of the bio-filtration scheme is a biologic trickling filter through which normally a recirculation of the filter effluent is maintained. The bio-filter is advantageously designed of relatively shallow depth, with consequent decrease in construction cost. The shallower depths also permit the use of generally finer filtering media without impairment of ventilation. The greater biologic efficiency of a finer media becomes available to an even further extent in stage-treatment where a smaller-sized rock may be employed in the secondary filter following the coarser rock in the primary bed.

Dosing of the bio-filter is continuous and at high rates by virtue of the application of the flow of recirculation. Sludge may be returned from the detention tank to the bio-filter mixed with the flow of recirculation applied to the filter bed. Such a procedure is analogous to the principle of return sludge in the activated sludge process and when so employed, the bio-filter may become in effect an activated trickling filter.

Design data based on research

Extensive experimental data have been assembled to serve as a guide in appraising the value of the bio-filtration process from the functional and cost viewpoints, and to serve as a basis for the development of a rational theory of engineering design.

Space does not here permit a detailed consideration of this subject; nor does it appear justifiable at this time to generalize in relation to more than a few of the underlying principles involved in bio-filtration. These are illustrated by the accompanying diagrams (Fig. 3) and are now discussed in broad outline. It should be understood that whereas the numerical values indicated by the curves are subject to adjustment in accordance with specific sewage, climatic, and other conditions encountered in design, the form of the curves themselves indicates relationships of general applicability. Note also that all purification results relate to previously settled sewage rather than to raw sewage.

The graph of progressive purification in relation to detention period (Fig. 3-A) shows that rapid biochemical oxidation occurs during an initial period of 2 hr. and particularly during the first hour. The economic limit of detention period is 6 hr. for domestic sewage. For trade wastes this period is correspondingly longer, approaching periods of aeration required by the activated sludge process. Collateral tests and observations indicate that relative stability increases with detention period, from 11 per cent to 99 per cent, corresponding to a range of 2 to 6 hr. detention period. Clarification and suspended solids removal also varies with detention period, being comparable to that of activated sludge when stage-treatment is used.

In Fig. 3-B is indicated the influence of the rate of filtration on purification. For single-stage treatment there occurs gradual decrease in percentage purification with an increased rate of filtration. At higher rates the percentages of biochemical oxygen demand removal tends to become substantially constant at a characteristic value. The investigations also reveal that the relative stability of the effluent is slightly affected by rate of filtration and that clarifica-

tion is somewhat impaired by increased rates of filtration.

The curve of Fig. 3-C illustrates the effect of disposition of filtering material on purification. Apparently over-all purification per cubic yard is not greatly influenced by the specific division of total rock volume between primary and secondary stages. However, a strict interpretation of the curve indicates that it might be desirable to provide a greater yardage in the primary filter, either by larger area at equal depth, or by the same area at greater depth, than that in the secondary unit.

The relationship between bio-filter capacity and rate of recirculation indicated by Fig. 3-D shows that the removal of oxygen demanding constituents per cubic yard varies directly with the ratio of recirculation rate to the rate of filtration. It also becomes evident that at recirculation ratios higher than approximately 6.0, the unit purifying capacity of the bio-filter diminishes. This is attributable to deterioration of biologic oxidizing capacity resulting from either excessive flushing action due to specifically high rates of passage of flow of recirculation through the filter bed, or through the impairment of ventilation of the bed due to incipient flooding. However, within a broad range of filtration rates a practically uniform quality of effluent may be ensured through the maintenance of a constant ratio of recirculation rate to rate of filtration (i.e., Re/F = constant). The operator of the plant has thus a means at his command to:

(1) Maintain a predetermined quality of effluent independently of fluctuations in sewage flow and/or oxygen demand of the sewage.

(2) Produce an effluent of higher or lower degree of oxidation at will, in conformity with seasonal requirements of final disposal.

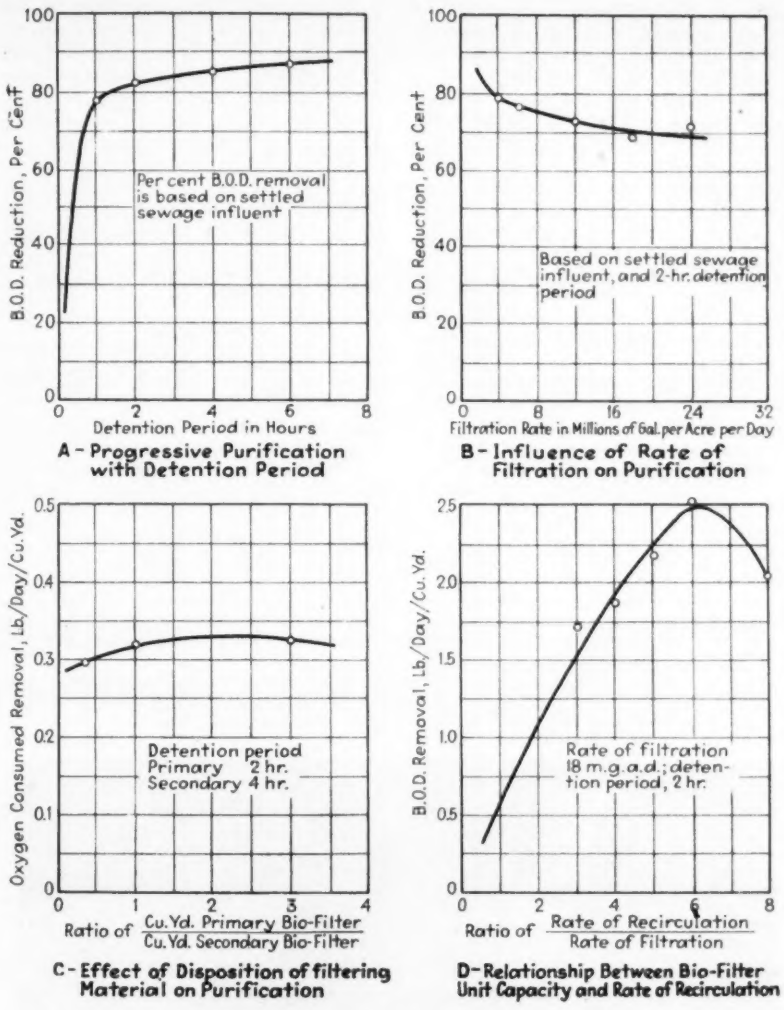

B.O.D. Reduction, Per Cent
Per cent B.O.D. removal is based on settled sewage influent
Detention Period in Hours
A - Progressive Purification with Detention Period
Based on settled sewage influent, and 2-hr. detention period
Filtration Rate in Millions of Gal. per Acre per Day
B - Influence of Rate of Filtration on Purification
Oxygen Consumed Removal, Lb./Day/Cu.Yd.
Detention period Primary 2 hr. Secondary 4 hr.
Ratio of Cu.Yd. Primary Bio-Filter / Cu.Yd. Secondary Bio-Filter
C - Effect of Disposition of filtering Material on Purification
B.O.D. Removal, Lb./Day/Cu.Yd.
Rate of filtration 18 m.g.a.d.; detention period, 2 hr.
Ratio of Rate of Recirculation / Rate of Filtration
D - Relationship Between Bio-Filter Unit Capacity and Rate of Recirculation

FIG. 3—RESULTS OBTAINED from experimental plant operation.

Application of results

In applying the foregoing conclusions derived from experimental plant operation, and evaluated in the light of current practice, it is believed that the following interpretation in terms of plant design will be of interest:

Single-Stage Complete Treatment. (Fig. 2-A)—This finds application in small and medium-sized installations. It can be used to treat weak and medium strength sewages and will serve as the initial construction for a two-stage plant. Primary settling should be provided in a functionally separate tank to avoid short-circuiting between influent and final effluent. The usual period of settling of 1½-2 hr. is employed. Settled sewage proceeds directly to the bio-filter before entering the detention tank.

The detention tank would have a capacity of 4 hr. to 6 hr. at average flow, based on economic limit of detention period shown in Fig. 3-A.

Using a recirculation ratio of 6 the detention tank settling area should be sufficient to result in a settling rate, based on this flow of recirculation, of not greater than 1,200 g.p.d. per sq.ft.

With a bio-filter having a 3-ft. depth of rock, the rate of filtration from curve of Fig. 3-B may be between 8 and 12 million gallons per acre per day. This will limit the passage of flow of recirculation through the filter bed to a rate of 6x12 m.g.a.d. = 72 m.g.a.d. Higher specific rates than this are apparently permissible with stage-treatment, but in single-stage working it appears that the bed should be of sufficient area to prevent the recirculation rate from exceeding approximately 80 m.g.a.d.

The size of filter rock may range from a grading of 1½-2½ in. to one of ¾-1½ in. The data in Figs. 3-B and 3-D were obtained with 1½-2½ in. grading.

On the effluent channel of the detention tank, a hydraulic control sill should be located upstream from the recirculation pump sump at an elevation somewhat lower than the tank effluent weir. By automatically maintaining a constant liquid level in the pump sump, the plant effluent discharge over the sill will correspond with variations in flow of incoming sewage.

Two stage complete treatment (Fig. 2-B)—This is a complete sewage treatment process suitable for medium-sized and large installations treating medium to strong sewages. A separate primary settling tank may be employed ahead of the primary detention tank, but the functional characteristics of 2-stage treatment permit the sedimentation of raw sewage sludge in a combined primary detention-settling tank.

The advantages of this combination are decreased cost of construction of a single tank of, say, 3 hr. to 4 hr. capacity over two tanks of 1½ hr. to 2 hr. capacity each. Also, for a given rate of recirculation through the primary system, the combined detention-settling tank provides a correspondingly longer period of sedimentation for the combined sludges (i.e., raw plus primary bio-filter sludge).

The chief disadvantage of the combined detention-settling tank is the opportunity for short-circuiting of primary effluent over the hydraulic control sill

between the primary and secondary system, without first having been accorded the full period of treatment through the primary bio-filter.

The primary and secondary recirculation systems of Fig. 2-B operate independently of each other and enable each detention tank to function in conjunction with the bio-filter of the corresponding stage. The rate of recirculation may be adjusted to the oxygen demand exerted within each stage of the treatment process. Experimental studies show that a recirculation ratio of 4 and 3, respectively, for the primary and secondary systems may be a typical value for design, when rates of filtration of 12 m.g.a.d. and upwards are adopted.

As in single-stage treatment, so in two-stage working, the rate of filtration adopted may be within quite wide limits, provided the rate of recirculation is made to correspond. For a given filter depth, such as three feet, the cubic yards of filter material will vary inversely with the value selected for the biochemical oxygen demand removal per cubic yard. This is directly dependent on the rate of recirculation, as shown by the curve of Fig. 3-D, which in turn conditions the power required for pumping. Accordingly for any given design situation, it is possible to determine an economic balance between the cost of construction of the bio-filter and that of operation of the recirculation pumps.

Although the bio-filter may be worked at extraordinarily high rates hitherto unattempted in practice with the trickling filter, whether considered from the point of view of sewage application per unit area or per unit volume of filter material, yet it appears logical to design for reasonably high rates of filtration and rely on meeting overload conditions through appropriately increasing rate of recirculation as an operating procedure when peak flows occur or as the average flow increases in the course of time. In the design illustrated in Fig. 2-B, a filtration rate of 12 m.g.a.d. has been assumed for both the primary and secondary bio-filters. Such a rate is equivalent to 24 m.g.a.d. on the basis of the conventional trickling filter depth of 6 ft. The bio-filter plant shown in Fig. 4 when operating at 24-34 m.g.a.d. per bed, produces an effluent suitable for irrigation purposes.

A suitable size of rock for the primary bed is $1\frac{1}{2}$-$2\frac{1}{2}$ in., and for the secondary bed, $\frac{3}{4}$-$1\frac{1}{2}$ in., although under California climatic conditions it appears possible to successfully use a grading as fine as $\frac{1}{2}$-$\frac{3}{4}$ in. for the second-stage bio-filter.

An hydraulic control sill is required between the primary and secondary stages, a convenient location being between the sumps of the recirculation pumps. The primary sill allows a flow corresponding with the sewage influent to pass into the secondary recirculation system; while the secondary sill permits a corresponding flow to be discharged as the final plant effluent from the treatment works.

Single-Stage Intermediate Treatment (Fig. 2-C)—This is provided for sewage treatment to a degree intermediate between plain sedimentation and biologic oxidation, to (1) augment the capacity of an existing sedimentation plant, or (2) provide new plant capable of producing an effluent oxidized to a greater or less degree in keeping with seasonal requirements of final disposal.

For new construction, the design calls for tankage of 3 to 4 hr. sewage flow, comprising an allowance of 2 hr. for primary sedimentation and 1 to 2 hr. for detention. Final sedimentation may also be accomplished satisfactorily in the same tank, provided the effective settling period in the combined detention-settling tank is not less than 1 hour.

TABLE I—ANALYSIS OF SINGLE-STAGE BIO-FILTRATION IN RELATION TO FILTER LOADING AND PURIFICATION EFFECTED

Rate of Filtration (F) M.G.A.D.	Rate of Recirculation (Re)		Rate of Sewage Application to Bio-Filter Gal./day/cu.yd.	Oxygen Consumed			
	Ratio Re/F	Actual M.G.A.D.		Settled Sewage p.p.m.	Bio-Filter Effluent p.p.m.	Per cent Reduction	Removal Lb./day/cu.yd.
4	5	20	820	74.4	22.2	70.5	0.36
6	5	30	1,230	74.8	24.5	67.3	0.52
12	5	60	2,460	76.1	27.5	63.8	1.00
18	6	108	3,690	79.5	30.5	61.8	1.51
24	5	120	4,920	78.2	28.0	64.2	2.07
24	4	96	4,920	75.8	30.8	59.4	1.84
24	2.5	60	4,920	72.3	37.7	48.0	1.06

Conditions of Operation:
Continuous-flow treatment of settled sewage effluent from primary clarifier of Salinas, Calif., municipal sewage works.
Average duration of test runs at each rate of filtration, 5 days.
Oxygen consumed results are median values of twice-daily samples during corresponding test periods.
Various rates of filtration obtained by changing rates of flow through the bio-filter plant, but chiefly by application of the sewage over appropriate number of zones within the bio-filter bed area.
Constant factors: Filter bed depth, 3 ft.: rock size, $1\frac{1}{2}$"-$2\frac{1}{2}$". Detention period, 2 hours.

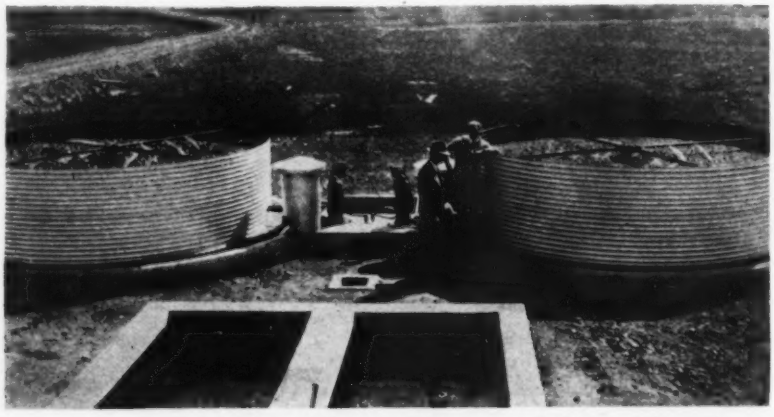
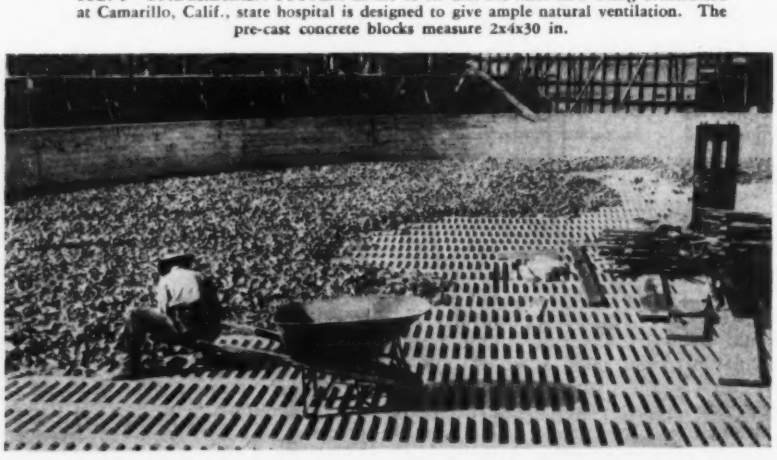


FIG. 4—FILTERS TREATING pre-settled sewage at the San Mateo, Calif., experimental plant operate at a rate of 24 to 34 m.g.a.d.

FIG. 5—UNDERDRAIN SYSTEM in the 85-ft. dia. bio-filter now being constructed at Camarillo, Calif., state hospital is designed to give ample natural ventilation. The pre-cast concrete blocks measure 2x4x30 in.



based on the flow of recirculation. Otherwise a final clarifier is required as noted in connection with the plant layout illustrated in Fig. 2-C.

The recirculation system should be designed for a recirculation rate of between 4 and 5 times the sewage flow. An economic study is involved in proportioning the size of the bio-filter to that of the combined detention-settling tank, so as to result in a minimum cost of recirculation and cost of providing final sedimentation, either as part of the detention tank or as a separate structure following it. The percentage biochemical oxygen demand reduction, over that of the sewage when subjected to primary sedimentation alone, will be of the order of magnitude shown in Fig. 3-B, for such corresponding rates of filtration as may be selected, and for which the bio-filter area may be computed.

For this intermediate treatment, which involves essentially what may be termed a roughing bio-filter, the size of filter material may be advantageously a grading of coarse rock such as 1½-2½ in. size.

For incorporation in an existing plant, the possibility exists in numerous cases of converting a primary settling tank into a detention-settling tank and operating a roughing bio-filter in conjunction therewith, followed by a final clarifier.

Conclusions

A comparison of the costs of bio-filtration with those of other sewage treatment methods should take into account the true annual costs based on fixed charges and operating expense. From cost analyses made by the writer, it appears that bio-filtration as a complete process compares favorably with the trickling filter in point of first cost, and with the activated sludge process as regards cost of operation. As an intermediate form of treatment, it should be, in both these respects, on a par with chemical precipitation.

It is anticipated that bio-filtration will become a useful addition to the available methods of sewage and industrial wastes treatment. Further research and practical-scale investigations should embrace a determination of the capacities and limitations of the mechanical, hydraulic, and biologic elements of the process.

For any given sewage or wastes to be treated, the designer should make a direct comparison between the efficiency, dependability, and economy of bio-filtration and the corresponding engineering elements of established methods.

Thin Arch Dam of Masonry Meets Park Requirements

THE city of Phoenix, Ariz., owns a mountain park at an elevation of about 6,000 ft. in the Bradshaw Mountains, some 50 miles north of the city in an air line. Recently it became necessary to build a dam in the park to provide storage for a portable water supply. Limitations that affected the design of the dam were (1) a long expensive haul for materials, (2) low winter temperatures, and (3) the need for a structure of good appearance that would not be unsightly in a park. A masonry dam 57 ft. high was found to satisfy requirements; granite was available at a quarry close by. The total cost of the structure as thus built was about $32,000.

The dam, known as the Barney Williams Dam, is located in the Horse Thief basin recreational area, comprising 4,400 acres in a high, well-wooded area which was deeded to the city by Congress in 1935. At present the park is accessible only by a 95-mile road including many steep grades. A new road project contemplates a high-type road of lower gradients and only 60 miles in length. This is expected to bring about extensive use of the park area.

A dam was required for developing surface storage because the tight rock formation affords little opportunity for underground storage. A suitably located reservoir site was found where about 60 acre-ft. could be stored by a dam of moderate height.

Dams of three types were considered; all-steel frame construction, rockfill with steel face, and a variable-radius masonry arch. Concrete was eliminated at the outset because cement would have to be hauled 40 miles from the nearest railway and sand and gravel would have to be trucked in 23 miles, in part up 18 percent grades. The decision to adopt the masonry dam was influenced by an excellent quarry site a few hundred feet from the dam, so that very little material would have to be hauled in, and by the attractive appearance of a masonry structure, which would be in harmony with the adjoining landscape.

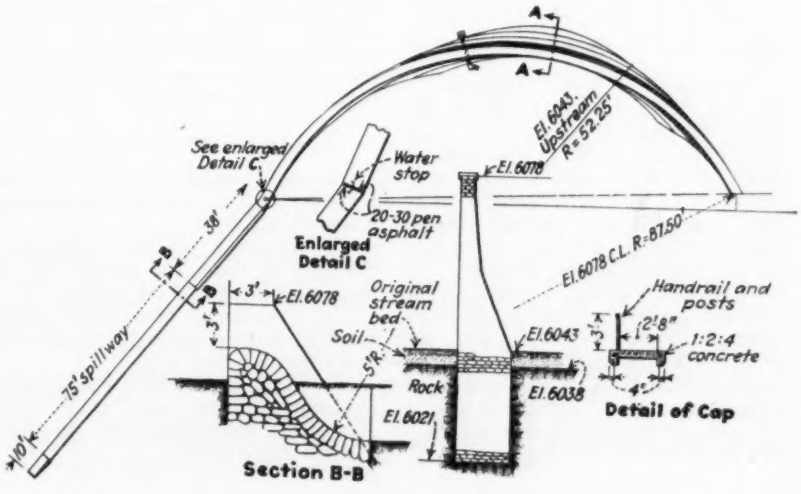
Design requirements

The Arizona state engineer's office, division of dams, imposed three requirements: no tension, no overhang, and compression limited to 400 lb. per sq.in. These were met satisfactorily. Roughly dressed granite stone set in 1:2 cement mortar without admixture was used. Stones were placed by the boom of a revolving dragline located inside the arch near the downstream face. The prohibition of overhang was met by the use of secondary arches in the bottom third of the structure.

Bidding mortar was placed in advance for each stone, and the stone was well rammed into the mortar; a minimum mortar thickness of 1 in. was required. With the larger stones a moderate quantity of spalls was used. In general no grouting or filling of the joints was done after the stones were placed. The smallest stones were of two-man size, while the larger stones were placed by the boom. Both vertical and horizontal bonding was aimed at, to avoid any regular coursing.

Details of the masonry requirements were: minimum thickness 8 in., width not less than thickness, length not less than 1½ times the width; at least one-

DETAILS of Barney Williams dam which stores 60AF of water for park supply.



fourth the area in the face to be headers, evenly distributed throughout the wall and breaking joint with the course below, no header longer than two-thirds the dam thickness and near the top of the dam not longer than 2 ft. Projections up to a maximum of 6 in. were allowed beyond the lines of the drawing where these projections did not interfere with symmetry of appearance. The face of the wall was always kept at least one course higher than the body of the dam.

The structure was designed by Richard Bennett, superintendent of the water department. Construction was under the supervision of C. E. Griggs, city engineer, and Frank Bromley was resident engineer. The contract was held by the O. F. Fisher Construction Co.

Water-Resource Study Begun On Nation-wide Scale

A detail survey of the utilization and planning of water resources in the country's major drainage basins is being carried out in cooperation with state and regional planning boards

CONSERVATION of water resources and their balanced development, utilization and control are the objectives of a comprehensive nation-wide study that has been undertaken by the Water Resources Committee of the National Resources Board. A preliminary report is to be made next December. The findings are expected to be a guide for future integrated development. The aims and general organization of the study program were outlined by Abel Wolman, chairman of the committee, before the Joint Planning Conference in Richmond, Va., on May 4. The following has been extracted from Mr. Wolman's paper. EDITOR.

PROBLEMS in the use and control of water resources of the nation are not new. Their importance, however, becomes clearer and clearer as competition for and conflict in their uses become more frequent and intense. The geographical distribution of such conflicts varies from time to time, and it is only in recent years that the controversial aspects of western water resources have penetrated into the east. Increases in population, more varied uses for water supply, competition between municipalities and industries for relatively limited quantities of water all tend to focus attention of the public upon a problem as old as civilization itself.

The study of water resources is likewise not a novel enterprise, for many millions of dollars and many years have been spent in their detailed study. In few instances, however, have our agencies been so constituted as to make it possible to review the national water problem as a whole and in particular relation to the economic and social situation of the country, as exemplified in land use, industrial development, population trends and the requirements of health and recreation. In this field as in all others, the detailed immediate problem, specific in nature and local in implication, has naturally held the attention in the past.

In undertaking a national study of water use and control in the major drainage basins of the United States the Water Resources Committee hopes to obtain a reasonably clear picture of each important drainage basin and at least a preliminary list of projects which may be properly constructed in keeping with its needs. Obviously with the limited time and financial resources available for the study only a skeleton plan, largely of preliminary character, is feasible. Such a bird's-eye view of the national problem and of the available data shedding light thereon should be the beginning of recurring and continuing adjustments in each major basin.

By this study it will be possible to furnish various federal, state and local agencies a clear statement of the dominant physical and economic considerations affecting the use and control of water resources in each basin, even though such a reasonably integrated pattern of development can be furnished only in broad outline. Out of this study a series of specific construction projects should also appear which might properly be executed as time goes on, in accordance with the plan of ultimate development.

Objectives of survey

The three major objectives in this proposed study of drainage basin water resources are:

(1) To point out the outstanding problems of water use and control in the different parts of the country.

(2) To outline in broad terms a reasonable and integrated pattern of development, and

(3) To present specific construction and study projects which, in the light of available information, are consistent with the broad plan.

Questions of administration and financing of programs and projects developed in the study will not be reported upon in any detail, since they offer problems of national policy which can be determined only after long discussion in the public forum.

Specific recommendations will vary greatly in detail from one basin to another. In some cases further surveys and investigations may be recommended before any construction work is proposed while in others it is probable that projects ready for construction or requiring a short period of detailed design, may be recommended.

In order to provide working arrangements with state planning and other boards, and to secure the continuous views and criticisms by state and federal authorities, the committee has assigned 17 water consultants to work with the state and regional boards. These consultants will be responsible for the conduct of the field work necessary for the preparation of the water plans. They have been selected according to major areas and convenience of operation. They will be responsible for the review of existing information and reports, for the crystallization of long range plans, and for the preparation of a final document embodying the answers to the three major objectives pointed out above.

The field and office operations leading to the preparation of the report proposed will be under the direction of Frederick H. Fowler of San Francisco, Calif. The assistant director is Merton L. Emerson of Boston, Mass.

Drainage basin districts

The Water Resources Committee will outline and supervise the study through the special organization established under Mr. Fowler's general direction. The drainage basin districts so far organized and the water consultants assigned to them are as follows. All of the studies are now under way and the detail of accomplishment must wait upon the receipt of the preliminary reports of these consultants.

District No. 1: H. K. Barrows, Boston, Mass.—Drainage basins in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut and New York, including the Housatonic as the westernmost basin.

District 2: James F. Sanborn, New York, N. Y.—North Atlantic drainage basins in Connecticut, New York, Pennsylvania, New Jersey and Delaware west of the Housatonic and including the Susquehanna as the most westerly basin.

District 3: William McKinney Piatt, Durham, N. C.—Chesapeake Bay and South Atlantic drainage in Maryland, Delaware, West Virginia, Virginia, North Carolina and South Carolina, south of the Susquehanna basin, including Port Royal Sound drainage as the most southerly basin.

District 4: Dean Blake VanLeer, Gainesville, Fla.—South Atlantic and Eastern

Gulf drainage in South Carolina, Georgia, Florida, Alabama and Mississippi from the Savannah basin on the northeast to Mobile Basin on the southwest, both inclusive.

District 5: Fred H. Weed, Cincinnati, Ohio—Ohio River drainage in New York, Pennsylvania, Maryland, West Virginia, Virginia, Kentucky, Tennessee, Ohio, Indiana, and Illinois.

District 6(a): Royce J. Tipton, Denver, Colo.—Southwest Gulf of Mexico drainage, south and west of Vermilion River, Louisiana and including drainage in the United States entering the Rio Grande south of Fort Quitman, Texas.

District 6(b): Gerard H. Matthes, Vicksburg, Miss. (By detail from Corps of Engineers, Mississippi River Commission.)—The alluvial Mississippi Basin and Gulf of Mexico drainage, in the States of Mississippi, Tennessee, Kentucky, Missouri, Arkansas and Louisiana, from Pascagoula River on the East to Vermilion on the West, both inclusive, and northerly to the mouth of the Missouri excluding the main drainage basins of the Red, Arkansas, Missouri and Ohio Basins, but including the White and St. Francis Basins to the west and drainage lying west of the Mobile River Basin to the East.

District 6(c) and 6(d): Wesley W. Horner, St. Louis, Mo.—Western Mississippi River drainage in Louisiana, Texas, New Mexico, Colorado, Oklahoma, Kansas, and Missouri, from the Red River basin northwardly to the Arkansas basin, both inclusive.

District 7(a): Wesley W. Horner, St. Louis, Mo. — Mississippi River Basin Drainage North of the Ohio and Missouri Basins, in Missouri, Iowa, Minnesota, Wisconsin, Indiana, and Illinois.

District 7(b):—LeRoy K. Sherman, Chicago, Ill.—Great Lakes and St. Lawrence River Drainage in Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, New York and Vermont.

District 8: S. T. Harding, Berkeley, Calif.—The northerly portion of the Missouri River basin, to and including the basin of the Platte River on the west side, and to and including the basin of Mosquito Creek on the east side, in Iowa, Minnesota, South Dakota, North Dakota, Montana, Wyoming, Colorado and Nebraska.

District 9: Frederick H. Fowler, Washington, D. C.—The portion of the Missouri River Basin south of the basin of the Platte River on the west side and south of the basin of Mosquito Creek on the east side, in Missouri, Iowa, Nebraska, Colorado, and Kansas.

District 10(a): J. C. Stevens, Portland, Ore.—The Colorado River basin in Arizona, New Mexico, Colorado, Wyoming, Utah, Nevada and California.

District 10(b): Walter L. Huber, San Francisco, Calif.—The Great Basin drainage in California, Nevada, Utah, Wyoming, Idaho and Oregon.

District 10(c): Ralph I. Meeker, Denver, Colo.—Southwest Pacific drainage in California and Oregon, to and including Smith River basin on the north.

District 11: Samuel B. Morris, Palo Alto, Calif.—Northwest Pacific drainage in Oregon, Nevada, Utah, Idaho, Wyoming, Montana, and Washington, from and excluding Smith River basin on the South.

To facilitate the work of these consultants and to maintain coordinated contact with state and regional planning boards, and other cooperating agencies, two regional coordinators have also been appointed by the National Resources Committee. These individuals will travel throughout the country for the purpose of assisting the water consultants and keeping them currently informed of various phases of the study so that uniformity of approach and of ultimate reporting will be assured. To accomplish this purpose the country has been divided into two major areas. The western area includes Districts 6(a), 6(c), 6(d), 8, 9, (10)a and 11 and will be covered by Donald M. Baker of Los Angeles. The eastern coordinator, Howard Critchlow of Trenton, New Jersey, will cover Districts 1, 2, 3, 4, 5, 6(b), 7(a), and 7(b).

The compilation of existing lists of rated water projects under new and improved rating methods will be under the supervision of Brent S. Drane. It will be his function to amplify existing lists of water projects throughout the United States by the addition of all new water projects planned by federal, state and regional agencies and such other projects as may be developed by the field forces and ultimately approved by the Director and the Committee.

Ultimate aims

For the first time in the history of this country the various federal, state and local interests in a drainage basin are to be brought together by this study for the development of a broad program. Aside from the important end result of developing a preliminary long range plan, the study should go far toward initiating cooperative planning activities in the field of water resources which it is hoped will continue long after the first national study has been completed. Progressive modification, refinement, and adjustment of program should be the continuing ultimate aim of this initial effort. The broad picture here proposed for the water resources of the United States will be the framework within which more detailed study and evolution should take place in the future.

Sewage Treatment Plant Furnishes Power

ELECTRIC power for municipal purposes is being generated in the new sewage treatment plant constructed in Durham, North Carolina, as a PWA project. The plant not only powers its own operation but supplements the regular water- and coal-operated units in supplying the city with electricity.

The power needed for the operation of the sewage treatment plant is generated by engines using gas developed in the plant's three sludge digestors. The gas is withdrawn and stored in a single-lift gas holder with a capacity of 50,000 cu.ft. All the gas produced is used for the generation of electricity.

The city of Durham owns and operates a small hydroelectric power plant of 1,500 kw. capacity for water and other municipal purposes. It has a stand-by power arrangement with the Durham Public Service Co. These two are hooked up with the sewage treatment plant electric output, so that whichever needs it can draw on one or both of the others for power.

Thus, if the city's hydro plant does not produce enough power to fill the water service reservoir, the energy is taken from the sewage treatment plant. When water is available, the power is repaid and used for operating the treatment plant.

It is planned soon to give this type of power reserve service to the city's filtration plant.

The power equipment consists of two 4-cylinder, 4-cycle vertical gas engines designed to operate on natural gas and produce 150 b.hp. Each is directly connected to a 100 kw. 2,300 volt generator with direct-connected exciters. A nine-panel switchboard of all steel construction controls all of the plant operations.

Discussing this plant, a report from PWA states: "An outdoor sub-station equipped with three 75 kv. 2,300 to 23,000 volt oil-cooled transformers is connected through a four mile transmission line to the line between the city's hydroelectric plant and the sub-station of the Durham Public Service Co., which is in turn served by the lines of the Duke Power Co.

This connection serves not only as a stand-by connection with the sewage plant for obtaining power either from the city's hydroelectric plant or from the Duke Power Company, but also permits an interchange of power between the sewage treatment plant and the city's hydroelectric plant at any hour of the day or night. During certain seasons of the year the hydroelectric plant is only operated the minimum number of hours each day as is necessary to fill all of the water service reservoirs. During the shutdown period, current for lighting the homes of the operatives and for minor water plant operations is supplied by current from the gas engines of the sewage disposal plant, during which period water is stored in the city's lake. Whenever necessary, the gas storage at the sewage plant is drawn upon to boost the current output.

Snow Surveys Predict Runoff

Stream discharges in upper Missouri River valley accurately forecast last year from studies of condition of snowfields, which will be continued as guide to future operation of Fort Peck reservoir

By G. A. Hathaway,
Senior Hydraulic Engineer, U. S. Engineer Dept., Kansas City, Mo.

THE FORT PECK DAM now under construction by the U. S. Engineer Department on the Missouri River in eastern Montana will create a reservoir with a useful storage capacity of 19,044,000 acre-ft. It is anticipated that the reservoir will be operated primarily in the interests of navigation and flood control; the development of hydroelectric power and the use of water for irrigation are incidental to the general scheme of operation. The importance of providing sufficient capacity to store the flood runoff during cycles of wet years, and also the necessity of maintaining the maximum possible volume in storage for supplying navigation deficiencies during a cycle of dry years, such as the period from 1929 to 1935, required that a careful and detailed study be made of the runoff characteristics of the upper Missouri basin. As the melting of mountain snows influences to a considerable extent the volume and rate of runoff of the Missouri River at the dam, advance information relative to the probable water yield of the snow in spring storage will be especially valuable, not only for the period that the dam is under construction but also for future operating requirements. To secure information on the water content and condition of the snow fields a system of snow-survey courses was established in the mountainous areas of the river basin above the dam early in 1933.

Snow surveying for predicting the water yield of the snow fields has been conducted in some of the western states for about 25 years. In general, the method used is to locate snow courses in mountain meadows or open spaces of rather flat topography that are sparsely timbered. A sufficient number of courses are established over the drainage area to secure a fairly reliable index of the snow cover. The same courses are used each year and actual measurements are made of the depth of snow and weighted snow volumes to determine the density and water content. The experience obtained from the snow surveys in the western states indicates that the snow cover at relatively high altitudes is fairly uniform for distances of 100 miles along the axes of mountain ranges, so that the runoff forecast for one stream can be applied to adjacent drainage areas, provided that topographic characteristics are similar. Experience also indicates that the water content of the snow in storage, on the first of March or the first of April of any year, with respect to a normal or mean water content, corresponds closely with a similar percentage relationship of runoff to normal of the stream into which the snow field is discharging. However, a divergence may result if the precipitation during the runoff season is not normal.

FIG. 1—OPERATION of Fort Peck reservoir will be guided by snow and stream studies made at these gaging stations in the upper Missouri River valley.

The drainage area of the Missouri River Basin above the dam site is 57,700 sq. miles. Approximately 41,000 sq. miles, or 70 per cent of the basin is in the Northern Great Plains and consists in the main of large gently rolling areas that have no forest cover. The general level of the plains rise gradually westward from an altitude of 2,200 ft. at Fort Peck to altitudes of 5,000 to 6,000 ft. at the foot of the Rocky Mountains. The Rocky Mountain front rises abruptly from the prairie to peaks of 9,000 to 10,000 ft. elevation.

Runoff figures

The upper Missouri Basin is characterized by a moderately low rainfall, a dry atmosphere, hot summers, cold winters and a large proportion of sunny days. The average annual precipitation is 15 in., with a tendency of the rainfall to increase with the elevation. The winters are long and cold. However they are relieved by occasional warm winds, known as "Chinooks," that very rapidly clear the plains area of snow. The average annual runoff of the Missouri River at Fort Peck over the 25-year period from 1910 to 1934 was 7,500,000 acre-ft., or 2.45 in. in depth over the drainage area. The maximum for the above period was 12,630,000 acre-ft. in 1917; the minimum, in 1931, was 3,902,000 acre-ft. All compilations are for climatic years, ending on September 30.

An interesting feature revealed by runoff studies is that 20 per cent of the drainage area, located in the high mountain regions, contributed an average of 60 per cent of the runoff at Fort Peck. A drainage area of 11,200 sq. miles contributes annually an average of 400 acre-ft. of runoff per sq. mile, while the remaining 46,500 sq. miles of drainage area above the dam contribute only 65 acre-ft. annually. The extreme variation in annual runoff, even from the

TABLE I—SEASONAL DISTRIBUTION OF RUNOFF

No. (See Map)	Stream Gaging Station	Per Cent of Annual Runoff Oct.-March	April-July	Aug.-Sept.
1.	Missouri River—Fort Peck	30	61	9
5.	Marias River—Shelby	18	74	8
6.	Sun River—Vaughn	19	74	7
7.	Dearborn River—Clemons	17	76	7
8.	Tenmile Creek—Rimini	10	88	2
9.	Big Hole River—Melrose	17	77	6
10.	Beaverhead River—Barratts	42	48	10
12.	Madison River—Hebgen Dam	38	49	13
17.	Musselshell River—Harlowton	22	73	5

TABLE II—SNOW SURVEY DATA, MISSOURI RIVER ABOVE FORT PECK

No. (See Map)	Snow Course	River Basin	Ave. Alt. Ft.	Water Content of Snow March 1—Normal In.	1934 In.	1934 % Nor.	1935 In.	1935 % Nor.
I.	Marias Pass	Marias	5,300	11.4	12.6	111	7.6	67
II.	Goat Mountain	Sun River	6,200	12.3	11.4	93	5.4	44
III.	Stemple Pass	Little Prickly Pear	6,900	7.6	8.0	105	5.4	71
IV.	Rimini	Tenmile Creek	6,900	18.0	7.2	40	4.7	26
V.	Gibbons Pass	Big Hole	7,100	20.0	...	...	14.2	71
VI.	Elk Horn Hot Springs	Beaverhead	8,000	13.7	6.8	50	4.1	30
VII.	Hebgen Dam	Madison	6,700	13.3	5.4	41	7.7	58
VIII.	West Yellowstone	Madison	6,750	16.0	6.3	39	8.8	55
IX.	Gallatin—Madison Pass	Gallatin-Madison	7,200	24.0	10.9	45	12.8	53
X.	Specimen Creek	Gallatin	6,850	9.4	3.3	35	6.8	72
XI.	Hood Meadow	Gallatin	6,500	12.0	2.4	20	5.7	48
XII.	King's Hill	Belt Creek-Smith-Musselshell-Judith	7,000	9.0	5.3	59	2.9	32

TABLE III—COMPARISON OF PREDICTED AND ACTUAL RUNOFF, 1935 SUMMER SEASON

No. (See Map)	Stream Gaging Station	Drainage Area Sq. Mi.	Runoff, Apr. 1-Aug. 1—Normal Thous. Acre-ft.	Actual 1935 Thous. Acre-ft.	Runoff, Per Cent of Normal—Actual 1935	Predicted 1935
1.	Missouri River—Fort Peck	57,700	4,578.0	2,224.0	49	55
3.	Missouri River—Fort Benton	24,600	3,332.0	1,601.0	48	55
5.	Marias River—Shelby	2,610	512.6	423.5	83	80
6.	Sun River—Vaughn	2,260	528.4	252.5	48	50
7.	Dearborn River—Clemons	122	71.0	39.8	56	60
8.	Tenmile Creek—Rimini	34	14.2	4.0	28	45
9.	Big Hole River—Melrose	2,500	745.8	397.8	53	60
10.	Beaverhead River—Barratts	2,850	145.4	66.6	46	50
11.	Madison River—Hebgen Dam	905	350.3	265.2	76	70
13.	Gallatin River—Gallatin Gateway	845	410.2	291.0	71	65
15.	Smith River—White Sulphur Springs	36	7.7	3.8	49	40
16.	Judith River—Utica	304	39.8	7.2	18	40
17.	Musselshell River—Harlowton	1,130	91.0	9.7	11	45

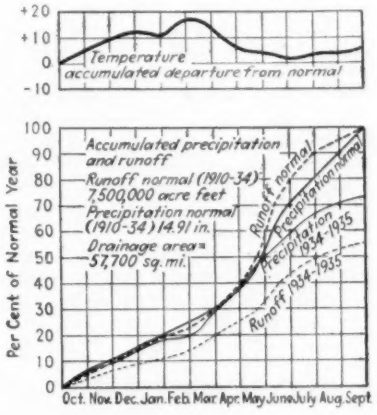


FIG. 2—CHARTS showing the accumulated precipitation, runoff and temperature for the climatic year 1934-35, compared with normal, aided in accurate forecasting of stream discharges, and indicate value of runoff predictions in future operation of Fort Peck reservoir.

mountainous areas, is shown by a comparison between the drainage areas of the Musselshell River at Harlowton, 110 acre-ft. per sq. mile, and the Madison River at Hebgen Dam, 800 acre-ft. per sq. mile. The average annual runoff of the Missouri River at Fort Peck is 130 acre-ft. per square mile.

In general 75 per cent of the total annual runoff from the mountainous areas occurs during the period April 1 to July 31. At Fort Peck the runoff during this period is reduced to 61 per cent of the total annual because of storage for power purposes, irrigation diversions and early runoff prior to April 1 from the plains areas. The seasonal distribution at representative stream-gaging stations is shown in Table I.

Snow survey courses

It was assumed that the percentage of normal water content of the snow in storage would be an indication of the corresponding percentage that the stream would bear to its normal runoff. Variations are to be expected due to the condition of ground storage, or priming of the soil, and the departure of precipitation and temperature from normal during the months of April to July, inclusive.

A total of twelve snow-survey courses (Fig. 1) was estbalished in the headwaters of the upper Missouri River. In locating the stations consideration was given to the accessibility, as well as to the various sections of the basin that produced the greatest runoff. With the exception of Stemple Pass (No. III), each snow-survey course is controlled by a stream-gaging station located nearby. Field surveys of the depth and water content of the snow are made at all courses on March 1 and May 1. In addition field surveys are made on the first of each month from January to May, inclusive, at three key courses; Marias Pass, Rimini and Hebgen Dam. The three key courses are so located as to supply a general index of the snow blanket for the entire mountainous area of the basin. Precipitation and temperature data are now being secured at the three key courses, the equipment at Rimini and Marias Pass having been installed early in 1935. The results obtained each month at the key courses provide important information as to the progress and manner of accumulation of the snow blanket. Surveys made in March at all of the stations generally require about 10 days and provide data for the April-July runoff forecast, while the May surveys show the effect of late storms, or the extent of melting, and are important in modifying the March forecast and in estimating the monthly distribution of flow.

Establishing normals

A total of 25 temperature and precipitation stations were selected for use in the studies (Fig. 1). Careful consideration was given to the location and altitude of these stations. Precipitation and temperature normals were established for the period 1910-1934, so that the results would be comparable to the stream-flow normals. Each station was weighted with respect to the tributary drainage area controlled and the total drainage area above the Fort Peck reservoir. The streamflow records for tributary drainage basins were not complete enough to develop normals for more than a 25-year period (1910-1934). At several of the stations it was necessary to estimate missing periods, but in general the records are complete. In developing the normals it was necessary to use actual and deduced natural streamflow to make the necessary corrections for reservoir regulations and irrigation diversions.

Although the streamflow, precipitation and temperature records used in establishing normals cover a period of 25 years, the snow-survey data cover only two seasons (1934-1935). For the present the method has been adopted of computing the normal water content of each snow course by comparing the 1934 and 1935 snow data with streamflow, precipitation and temperature records. Results of the 1934 and 1935 snow surveys made in March, as well as the estimated normal water content of the snow on March 1, are summarized in Table II.

With information available regarding the water content of the snow in storage on March 1 and the trend of precipitation and temperature computed up to date, an estimate was made in March, 1935, of the probable April-July runoff from the tributary areas best suited to reflect the snow runoff. After carefully weighing the tributary estimates it was predicted that the runoff would be 55 per cent of normal from the drainage area above Fort Peck dur-

ing the period April to July, inclusive, provided that the trend of precipitation for the basin continued at 75 per cent of normal and the accumulated departure of temperature continued from 3 to 4 deg. above normal. The actual recorded flow from April to July, inclusive, was 49 per cent of normal, a variation from the predicted flow of 6 per cent.

Data regarding the estimated and actual April-July, 1935, runoff of the Missouri River at Fort Peck and of the tributary areas are summarized in Table III.

The greatest difference between the predicted and actual flow was for the small drainage areas of Judith River near Utica and the Musselshell River at Harlowton. Irrigation diversions above these stations were unusually heavy, with very little return flow because of the depleted state of the normal ground-water storage.

Graphs as shown in Fig. 2 were plotted for all stream-gaging stations used in the study. The weighted precipitation, temperature and runoff are computed and plotted on these graphs at the end of each month. An inspection of the graphs gives an excellent check on conditions in general over the basin at any time, particularly with regard to the relation of the trend of precipitation, temperature and runoff to a normal year.

The results obtained up to the present time with snow surveys in the upper Missouri Basin have been most encouraging. It is anticipated that the reliability of the forecast will improve with added experience and with each additional year that snow survey data are secured. It would be desirable to expand the snow-survey program in the Missouri River Basin to include the headwaters of the Yellowstone and Cheyenne Rivers, for these streams will produce the greater portion of the flow of the Missouri River at Yankton, S. Dak., during storage periods at the Fort Peck reservoir. The problem of operating the reservoir for supplying navigation deficiencies below Yankton will be simplified if reliable forecasts of the trend of runoff for the Yellowstone and Cheyenne rivers are available.

Personnel

The snow-survey program in the upper Missouri River Basin is under the supervision of the Missouri River Division, U. S. Engineer Department, with Col. R. C. Moore, division engineer, in charge. For suggestions and information on snow surveying the writer is indebted to J. E. Church, meteorologist, Agricultural Experiment Station, University of Nevada, Reno, Nev. Valuable assistance was also rendered by the section directors of the Weather Bureau for the states of Montana and Wyoming, in securing and promptly forwarding precipitation and temperature data. All field data in connection with the snow surveys are secured by the district office of the U. S. Geological Survey at Helena, Mont., under the supervision of William A. Lamb, district engineer.

Calculating Unavoidable Delays on Contract Work

By Joseph T. Button
Resident Engineer Inspector PWA, Kewaunee, Wis.

DELAYS termed unavoidable, beyond the control and without the fault or negligence of the contractor, have long been a subject of heated arguments, and in many cases court procedure has been necessary to determine justice to the parties concerned. Current specifications almost without exception contain a paragraph on delays, and such phrases as "acts of God," "public enemy," "acts of the Government," "fires, floods and epidemics," "quarantine restrictions," "strikes," and "severe weather conditions" are familiar to every contractor, architect and inspecting engineer.

The importance of time in the construction industry is variable, depending largely upon the type of project. For example, many bridge jobs must be completed during the low water season and before the spring floods. In this case an extension of time, if allowed, would be of little value to the contractor. On many projects the time for completion is set by the owner, and the bidder adjusts his figure in consideration thereof. In most cases the element of time is a part of the bid, wherein the bidder agrees to do the work for a certain figure and in a certain time. Here the contractor, from past experience, can determine very closely the number of days he will lose due to inclement weather, which factor is considered in his bid for time.

However, any one or a number of other abnormal conditions may affect the contractor's progress to such an extent that an accurate determination of his actual delay may present a very difficult problem. To illustrate: A discrepancy in the contract plans may delay the construction of the interior partitions for a building. At the same time, although delayed in this particular branch of the work, the contractor continues with the roof construction and numerous other jobs not dependent upon the completion of the interior partitions. Yet will anyone deny that a delay of the contractor's work actually exists? Failure to build the interior partitions on time will delay such items as lathing and plastering, floor finishing, interior finish, and painting, as well as all of the mechanical trades. It can be readily seen that such a delay is accumulative, and its true effect and magnitude are quite indeterminate to exactness.

Consideration of the labor element offers a means to determine the extent of delays in fairness to both the contractor and the owner. No matter what the nature or cause of a delay, it is the labor of the project that suffers and is directly affected. The progress of every contract is dependent largely upon labor, and in general, is proportional to labor activity. When the progress of a contract is retarded there is a corresponding reduction in labor, and when work is resumed there is an increase.

Assuming that the progress is 100 per cent when the contractor is working a full crew, it is possible to determine in terms of labor the delay in days caused by an abnormal condition that has reduced the contractor's force. Taking the illustration of the building referred to above: assume that the contractor was delayed five days in the building of interior partitions. During that five days he worked an average of twenty men per day on other parts of the job not affected by the delay. Assume that had the delay not existed he would have worked an average of 25 men per day. If 25 men are regarded as the contractor's full crew or 100 per cent, then the job's progress is 20/25 or 80 per cent efficient. In other terms, he is being delayed 20 per cent. Since the delay lasted for five days, he actually lost 20 per cent of five days or one day. This may be expresed by the formula:

$$\text{Actual delay in days} = \left(1 - \frac{\text{av. no. worked per day}}{\text{av. no. full crew per day}}\right) \times \text{apparent delay in days}$$

Values for this formula are determinate. Consider two extreme conditions: First, by assuming that there was no delay. Then the numerator of the fraction equals the denominator and its value becomes unity, thus making the value of the expression in parenthesis equal to zero, and the right hand side of the equation equals zero, which is true. Then assume the job to be completely shut down with no one working. Then the value within the parenthesis becomes one and the actual delay in days equals the apparent delay in days. The needed values are easily obtained from the contractor's payroll. The contractor's average full crew, had the delay not existed, would, in fairness to both

the contractor and the owner, be a figure established by these two parties.

It should be understood that this formula is not to be applied every time there is a lull in the contractor's operations. It should be used only in the event of a delay beyond the control and without the fault or negligence of the contractor. The first step, therefore, would be to determine whether an irresponsible delay actually existed. With the existence of a delay, the log of the job would reveal when it started and ended. It is believed that if this method were adopted, it would not only operate in a greater degree of fairness to all parties concerned, but would prevent many legal entanglements and expedite the closing of contracts upon completion of the work.

Measuring Bed Rock Action Under Tygart Dam

Elastic wire strain meters registering at nine depths from 30 to 170 ft. will be read for deformations of foundation rock

By J. E. Deignan
Assistant Engineer, U. S. Engineer Office, Pittsburgh, Pa.

A NEW use has been found for instruments of the elastic-wire strain meter type (*ENR*, May 16, 1935) in the measurement of foundation deformations of Tygart River reservoir dam. Located near Grafton, W. Va., on the Tygart River about 18 miles above its confluence with the Monongahela River, the dam is a straight gravity structure with a crest length of 1850 ft. and a maximum height above rock of about 232 ft. A spillway section, 490 ft. long, will hold the reservoir level 23 ft. below the top of the abutment section. The central part of the dam is founded on a sandstone blanket, 20 ft. thick, which is badly seamed and blocked, and which in turn overlies a soft stratified shale containing occasional clay and carboniferous veins. Cores from the underlying shale show a modulus of elasticity ranging from 68,200 to 333,000 lb. per sq.in. and a compressive strength of 596 to 1840 lb. per sq.in.

As part of the research program in progress, it was decided to study the deformations in the shale at various depths over the base area of a typical monolith, under various loadings of the dam. Accordingly, nine 2½ in. core holes from 30 to 170 ft. in depth were drilled in the shale over the base of one of the spillway monoliths, the spacing of the holes being concentrated near the toe of the section; Fig. 3 shows the location and depths of the holes that have been put down.

Plunger transmits movements

Deformations are transmitted through an extra heavy ¾-in. pipe plunger grouted in the bottom of the hole and extending upward through a 2½-in. casing which prevents the blocking of the hole during the foundation consolidation grouting. Specially constructed electrical elastic-wire deformation gages, having a range of approximately 0.5 in. and reading to 0.00001-in., are used for measuring the deformations and determining the temperature at the top of the plunger. One end of the meter is attached to the pipe by a coupling (Figs. 1 and 2) and the other end is fastened rigidly to the dam through a 3-in. structural iron channel supported on four ⅝-in. anchor bolts which are enclosed in an inverted can made of 12-in. pipe not only as protection for the meter until embedded in the succeeding lift of concrete, but to prevent any possible interference to the apparatus by plastic deformations in the surrounding concrete. In addition, electrical resistance thermometers, placed inside and at the bottom of the plunger, are available to determine any correction needed for variations in length of the plunger itself due to temperature changes. Lead wires are run to a common terminal board located in an adjacent gallery. The arrangement of the plunger and the deformation gage is shown in Fig. 2.

Hole No. 1 terminates in a gallery of the dam and is the only gage accessible for inspection. Reference points have been placed on this instrument so that it may be checked periodically with a 10-in. Whittemore strain gage.

The choice of electrical measuring instruments was governed in a large degree, in this case, by the fact that the lead wires could be run to any convenient gallery.

Tygart River Reservoir Dam is a PWA flood control project being constructed under the supervision of the Corps of Engineers, U. S. Army, Pittsburgh District. Major W. D. Styer is the district engineer; C. M. Wellons, principal engineer, and Capt. B. C. Fowlkes, officer in charge.

FIG. 1—DEFORMATION gage in place ready for the protecting cover. Buried in the dam concrete these gages will record foundation deformation for remote reading, registering from nine rock depths from 30 to 170 ft.

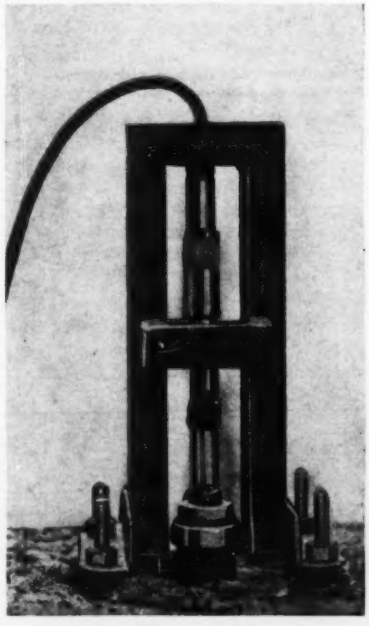


FIG. 2—DETAILS of deformation-gage installed at Tygart dam to record foundation deformations.

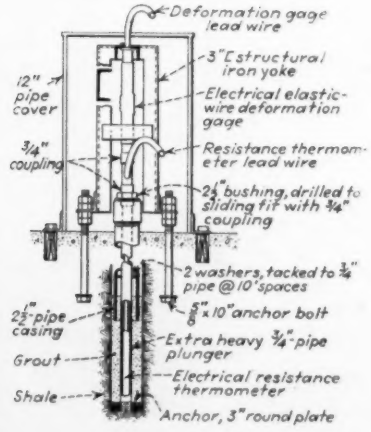
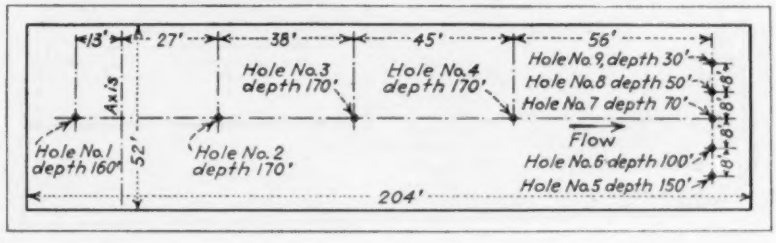

Deformation gage lead wire
3" C structural iron yoke
12" pipe cover
Electrical elastic-wire deformation gage
¾" coupling
Resistance thermometer lead wire
2½" bushing, drilled to sliding fit with ¾" coupling
2 washers, tacked to ¾" pipe @ 10' spaces
2½" pipe casing
⅝" x 10" anchor bolt
Extra heavy ¾" pipe plunger
Grout
Electrical resistance thermometer
Shale
Anchor, 3" round plate

FIG. 3—LOCATIONS and depths of deformation test holes under Tygart dam.



Improved Soil Testing Methods

New instruments for consolidation, shear and permeability tests contributed to the soil investigations on the Muskingum project

By Glennon Gilboy
Associate Professor of Soil Mechanics
Massachusetts Institute of Technology
Cambridge, Mass.

IN THE RAPIDLY growing field of soil mechanics an ever-present problem is the development of new apparatus and methods of testing. Some recent advances with which the writer has been closely associated resulted in improved instruments and methods, which are here briefly described in the hope that they may be of assistance to other investigators.

Consolidation tests

The basic idea of the consolidation test on clay is now so generally understood that no detailed description need be given here. Briefly, it is a test in which a cylinder of clay, short in proportion to diameter, and laterally restrained, can be compressed or allowed to expand, with provision for free passage of water out of or into the voids as load is applied or released.(1)

Subsequent to the studies of Dr Arthur Casagrande on consolidated marine clays, which showed the necessity of testing undisturbed samples, (2) the piston-and-cylinder apparatus developed at M.I.T. under Dr. Charles Terzaghi (3) was superseded by a ring device illustrated in Fig. 1. In preparation, the ring can be separated from the rest of the apparatus, thus allowing the sample to be fitted into place with a minimum of distortion. Disks of porous refractory material provide free drainage top and bottom. An L-shaped sealing ring of thin bronze has been found efficacious in preventing soft clay from squeezing past the upper disk. A cylinder of thin sheet rubber, bound into the depressions in the ring and the top bearing plate, prevents evaporation from the upper surface.

Fig. 2 shows the device mounted in the newest type of loading machine. The latter, utilizing a platform scale and a screw jack, is a distinct improvement over the old dead-weight arrangements. The modifications made in the scale are as follows:

1. The sheet-steel platform is reinforced by a ⅜-in. steel plate underneath to provide greater rigidity.

2. A small counterweight is applied to the beam just forward of the fulcrum to bring the center of gravity of the beam assembly into the plane of the knife-edges. This corrects the slight eccentricity introduced by the manufacturer to provide a damping characteristic for ordinary weighing, and makes the load on the platform independent of the tilt of the beam.

3. The horizontal bars in the beam-stop are cut out, allowing the end of the beam a free travel of 7½ in. Thus the platform can move 0.075 in. without any change of load.

4. The vertical members of the beam-stop are drilled and tapped for two opposing thumb-screws, which are used to lock the beam when the load is being changed.

5. The pillar is cut short for better appearance and greater ease of operation.

The yoke is guided by sleeves in the supporting framework, and its weight is counterbalanced by springs. Friction in the jack and in the guides has no effect whatever on the load applied to the sample.

FIG. 1—CONSOLIDATION measurements of clays were made on undisturbed samples in a ring instrument with pressure plates of porous stone.

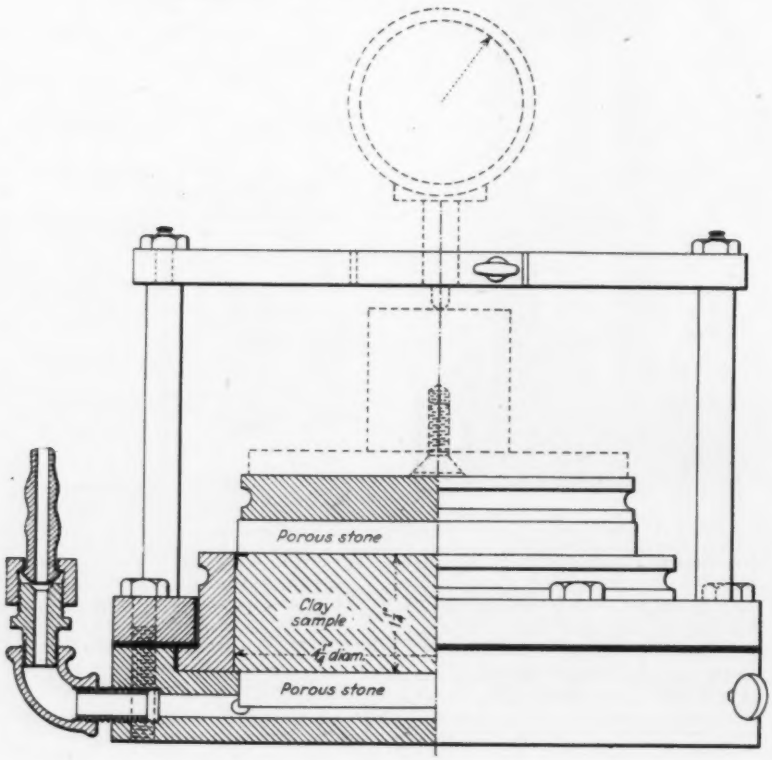


FIG. 2—A JACK combined with a modified platform scale proves a convenient loading rig for both consolidation and shear tests.

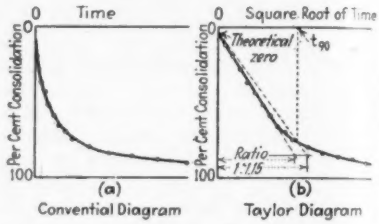


FIG. 3—EVALUATING the results of consolidation tests is facilitated by a new method of plotting.

Analysis of consolidation curves

Determination of the coefficient of consolidation of a soil from a time-consolidation curve has in the past been

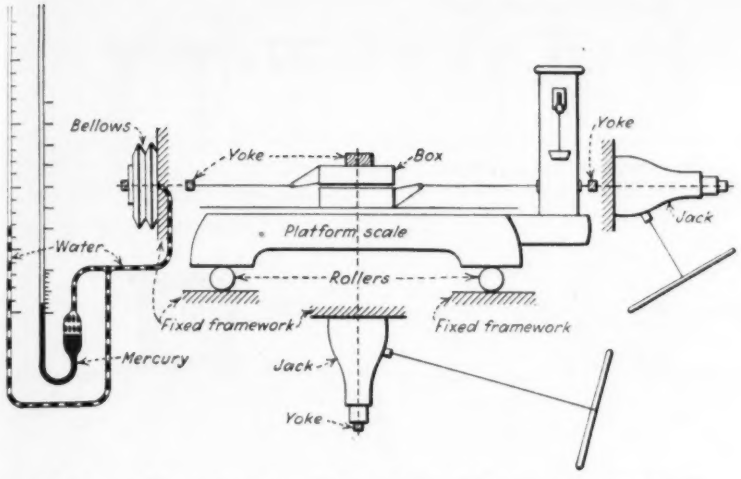


FIG. 4—SHEAR TESTS OF SOIL SAMPLES are made in a device that permits vertical movement under maintained load.

a rather tedious process.(3) A new method, devised by Mr. Taylor, shortens the work considerably. Instead of the conventional plot, shown in Fig. 3a, values of per cent consolidation are plotted against the *square root of the time*, as in Fig. 3b. The upper portion of the curve comes out a straight line. Minor deviations due to errors of observation can be adjusted by eye. The point where the straight line intersects the vertical axis is the theoretical zero. If another straight line is drawn through the theoretical zero in such a manner that its horizontal intercept is to that of the first line as $\sqrt{5.33}$ is to $\sqrt{4}$, or as 1.15 is to 1, the point where this line cuts the curve represents theoretical 90% consolidation. If the time corresponding to this point is called t_{90}, the coefficient of consolidation, c, is given by the relation

$$c = \frac{0.848\ h_o^2}{t_{90}}$$

wherein h_o is the reduced length of path of percolation in the soil sample.

The recent studies have also brought out the fact that the equation for the theoretical consolidation curve can be replaced, with an error of less than one-half of one per cent, by the simple expressions:

$T = 0.7854\ Q^2$, for Q from 0 to 0.5, and $T = -0.9332\ log\ (1-Q) - 0.0851$ for Q from 0.5 to 1.0.

In these equations, Q is per cent consolidation expressed as a decimal and T is the time factor, an abstract number equal to the ratio $\frac{ct}{h_o^2}$, wherein t is actual time and c and h_o are the characteristics of the actual soil mass as defined above.

Shear tests

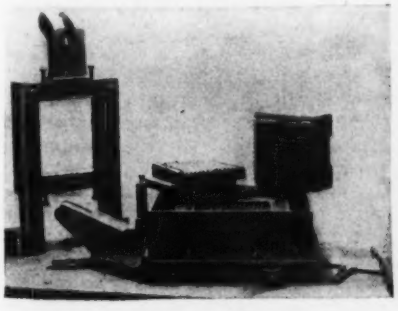
Numerous devices have been designed for measuring the shearing resistance of soils. A common type is one in which the soil is held in a shallow box divided horizontally into a lower and upper section which can be moved relative to one another in a horizontal sense. A vertical load is applied to the soil, and the force required to produce failure in shear on the plane of separation is measured. Ridges or teeth are usually provided in the two elements to ensure an approximately uniform distribution of shearing stress.

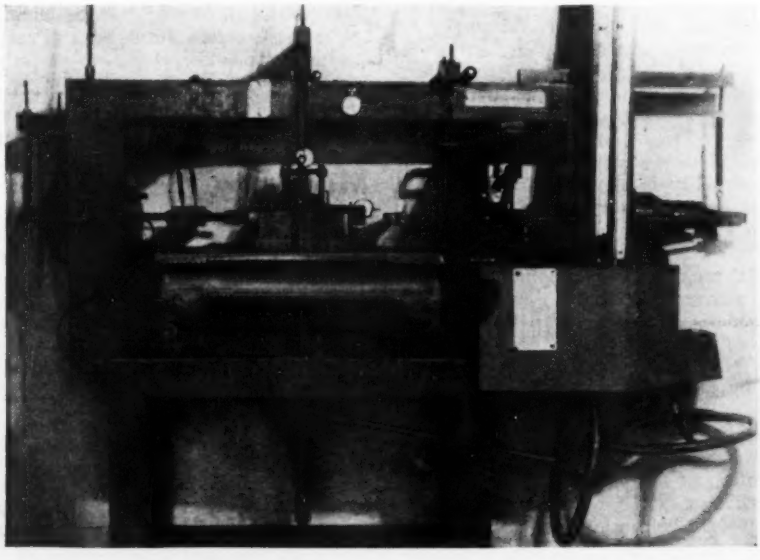
An important item, overlooked in some designs, is that during the shearing process the sample must be free to deform vertically without change of load. When this condition is not fulfilled, tests on compact granular soils, which expand appreciably when sheared, give high friction angles under low loads, decreasing as load increases.

In the summer of 1934 a shearing machine embodying certain interesting features was designed by the writer for the soils laboratory of the U. S. Engineer Office at Zanesville, Ohio. The essential parts are shown schematically in Fig 4. Vertical load is applied in a manner identical with that in the consolidation device previously described. The scale and the lower section of the box are moved as a unit by the horizontal jack. The reaction, which is the net shearing force, is measured by a Powers bellows filled with water and connected to manometers, mercury for heavy loads, water for light. The areas of the manometer tubes are small compared to the bellows, so that the upper section of the box is practically stationary in a horizontal sense. Constancy of vertical pressure irrespective of expansion or contraction of the sample during shear is assured by allowing the scale beam to float freely.

Fig. 5 is a photograph of the device. Due to the pressure of time, the simplest type of timber framework was used. However, the parts which really mattered were constructed with the requisite accuracy, and the apparatus functioned smoothly from the start. Fig. 6 shows

FIGS. 5 AND 6—THE shear testing device (right) and the smooth face obtained in a typical shear test (below).





the shearing box and a sample after a test, illustrating the clean-cut shear failures obtained.

Sampling—Test pits sunk for exploration in the Zanesville District disclosed considerable material of a type which has always been difficult to sample; a mixture of grains of widely varying sizes, with enough fine material to produce appreciable cohesion, and enough gravel and pebbles to prohibit the use of an edged sampling cylinder.

To obtain samples for permeability tests, the writer developed a scheme utilizing a wooden sampling box of 1-ft. cube, assembled with screws and long bolts and waterproofed with aluminum paint.

The first operation is to excavate half the pit to a depth of about 2 ft. below the existing bottom. On the ledge thus formed a column of soil about 10 in. square is isolated by careful excavation with a trowel or other small tool. The box, without top or bottom, is lowered around the soil column. The spaces at the sides are filled with damp sand, tamped carefully in small amounts, filling the holes left by small stones, and forming a snug packing between box and sample (Fig. 7a). The top of the sample is trimmed down to about 1 in. below the upper edge of the box and covered with sand. The sand is compacted and struck off flush with the top of the box. The cover is applied and screwed into place (Fig. 7b).

A spade is forced into the soil a few inches below the box, and the whole thing is turned over (Fig. 7c). The excess soil (now at the top) is trimmed down, the sand packing is finished and struck off, and the sixth face of the box is fastened in place (Fig. 7d).

Testing—In the laboratory the four faces of the sample through which water is not going to pass are successively sealed with paraffin (Fig. 7e). During this operation measurements are taken to determine the average net dimensions of the sample.

The sample thus encased is placed in a test box, with a filter and screen at the bottom, and the paraffined sides are sealed to the box by local melting. The sample is saturated by slow immersion, allowing water to percolate from bottom to top. Then a standpipe assembly is fastened to the top of the box, and the permeability is measured by filling the standpipe and observing the fall in head as a function of time. The apparatus is shown schematically in Fig. 7f. For photographs of the sampling and testing devices see ENR, April 9, 1936, p. 533.

One of the principal advantages of this method is the simplicity and compactness of the field equipment and the ease with which the sample is obtained, even by a person unskilled in laboratory work. The tedious part is the application of the paraffin seals, and it is hoped that an improved procedure can be evolved before long.

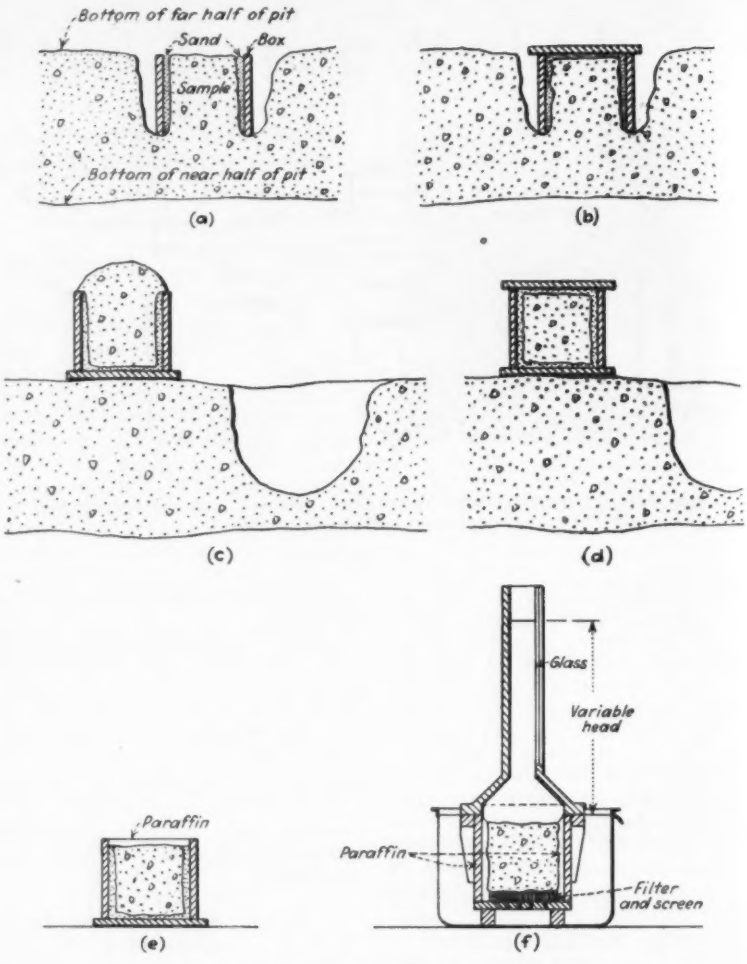


FIG. 7—TAKING permeability samples and testing them.

The Zanesville project is under the direction of Lt. Col. J. D. Arthur, Jr., District Engineer, with T. T. Knappen as Chief Engineer. Special credit is due R. R. Philippe, Director of the Soils Laboratory, and B. K. Hough, Jr., and J. P. Hartman, formerly of the laboratory staff, but now stationed at Passamaquoddy and Fort Peck respectively.

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Personnel Requirements for Administering Municipal Services

It takes nearly 480,000 people to run the 746 cities of the country over 10,000 population, according to *The 1936 Municipal Year Book*, recently issued by the International City Managers' Association. This averages 9.4 employees for every 1,000 people, ranging from 6.1 employees in the smallest cities to 11.7 employees in cities over 500,000.

Taking the number of employees per thousand population as an index of municipal employment it was determined that there was an increase of personnel in all cities over 30,000 from 9.2 in 1934 to 9.9 in 1935. In the cities between 30,000 and 100,000 there was a decrease from 7.5 to 7.2.

This year for the first time *The Year Book* took a census of original or "new" appointments to full-time positions in the municipal service, finding that in 596 cities, 19,663 such appointments were made in 1935. This meant that for every 100 full-time employees 1935 saw 5.7 new jobs created. Comparison with this information in 1936 and later years will show whether municipal employment opportunities are expanding.

A Runaway River Controlled

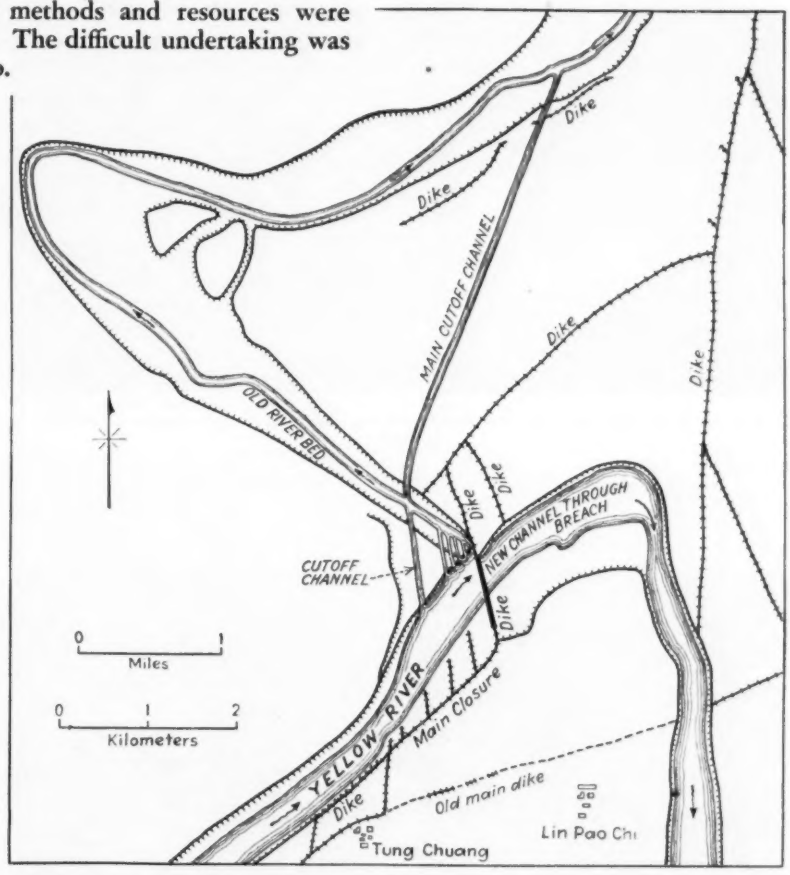
When a great dike break threatened to change the course of China's Yellow River last summer, native methods and resources were called on to close the crevasse . . . The difficult undertaking was successfully completed a month ago.

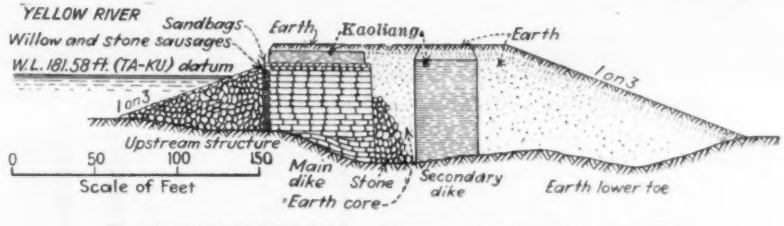
O. J. Todd
Consulting Engineer to the Shantung Government and the Yellow River Commission, Peiping, China.

DURING the flood of July, 1935, in the well-known Yellow River valley of China, a great dike breach or crevasse occurred in the western part of Shantung province, near the towns of Tung Chuang and Lin Pao Chi. The flooding directly affected 4,000,000 people and produced losses estimated at $75,000,000 in two provinces. Patrolling at this point in western Shantung, it seems, had not been carefully followed out during the highwater period of summer and weakening of the dike had not been discovered.

There was imminent danger that the new course might become permanent, for the Yellow River does not automatically return to its old bed after a serious dike break such as this. Many times before in the past forty or more centuries of recorded history it has changed its course. It was urgently necessary to force the flow back into the old bed. The formidable task was at once undertaken, and a month ago it was successfully accomplished.

The breaches in the main south dike were something over 1½ mi. in length. They occurred at a bend in the river when the maximum flood was on, though a freeboard of about 3 ft. still remained. Impinging currents produced a gouging flow that rapidly eroded the earth dikes,





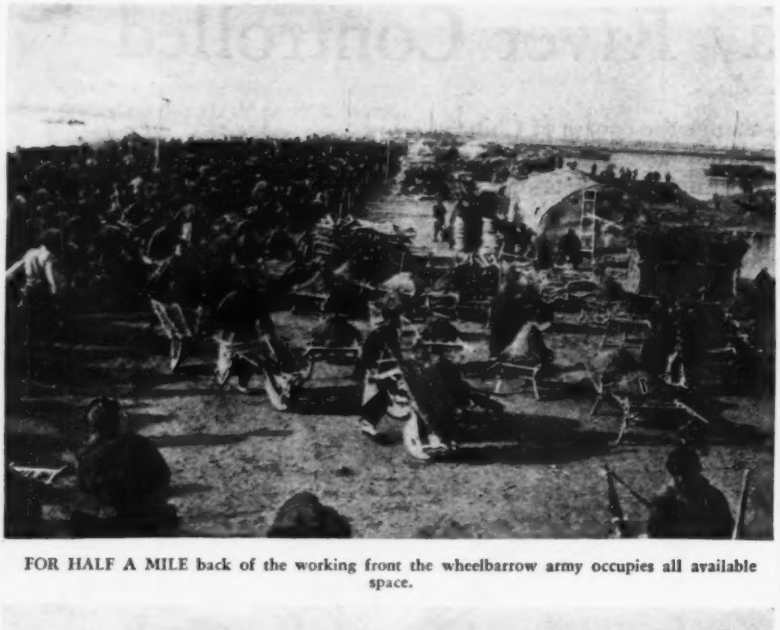
THE YELLOW RIVER BREAK and structure of the kaoliang closure dike.

OVER 1,000 TONS of rope were made at the dike break.

which were of a sand-clay mixture and were not revetted. Some kind of a dam had to be built across the crevasse and so connected with the river dikes as to force the water back into the original channel.

Two general working plans were considered. One of these, the trestle-and-rock-fill-dam method was similar to that procedure employed on the Yellow River 13 years ago, and also similar to that adopted for the final control of the lower Colorado River break in the United States in 1905. It had proved satisfactory in both these cases. Its underlying theory was that flowing water can best be diverted in alluvial soils by first paving a broad belt with stone to arrest scour to depths that produce high velocities. An aid to this is an adequate cut-off channel to carry the river's low-water flow from a point just above the dike closure across a bend giving a better gradient than the old bed and inducing swifter flow. The other method is the old Chinese contraction method. This latter was adopted, with some improvements.

The main work began in December of last year and was completed in late March of the current year, despite a very cold winter, during which for a month the river was entirely frozen over and men could walk back and forth across it.



FOR HALF A MILE back of the working front the wheelbarrow army occupies all available space.

MAT HUTS SERVE as houses for wheelbarrowmen at Tung-chuang closure.

Left—EXTENDING THE DIKE from the north end into deep water with the help of a kaoliang cradle.

In the contraction method the two ends of the closure dike adopted are built up with care, commencing well back of all breaks along the old alignment. The point of closure is chosen so that it will be where there is a clay rather than a sand bed to build upon, for this whole Yellow River plain is built up in alternate layers of fine sand or silt and clay, the individual strata varying greatly in thickness.

After the north end of the old dike had been thoroughly fixed with heavy stone revetment, so that no more of this could be cut away by the flow down the new channel through the break, the southwest end of the dike was advanced until a gap 2,735 ft. wide remained. This work on the south end was of earth, the main dike being 49 ft. wide on top with side slopes 1 on 3. Four spur dikes connected to this main dike, and extending into the river, have kaoliang stalk cores and stone protection at the ends exposed to currents. They point downstream at an angle of nearly 45 deg. and vary in length from 780 ft. to 1,640 ft. thus serving as adequate protection to the main base dike of earth. These spur dikes are 3 ft. lower than the main base dike, are 33 ft. wide on top, and have side slopes of 1 on 3. They are all hand packed by stone "flappers," each operated by eight men and weighing about 80 lb.

Except for the final 130 ft., where a special willow casing and stone-filled "sausage" section was built, the last 2,735 ft. stretch of the closure dike was made with a kaoliang stalk core faced with a stone upstream toe laid on a woven willow fascine mattress fastened together with wire and anchored to the main dike by locally made wire ropes. This main kaoliang stalk core is 49 ft. wide, has vertical sides, and is thoroughly tied together by locally made hemp rope 1½ to 2 in. in diameter. It is then backed by an earth fill 33 ft. wide on top with side slope of 1 on 3 on the downstream face. The main core carries an earth cover of 3-ft. depth.

Hand labor and job-made ropes

The use of hand labor and local materials has been practiced along the Yellow River for centuries. Since common labor costs from 10 cents to 15 cents U. S. per day in this region it is used in preference to machinery. The local materials are earth, stone, kaoliang stalks, willow and hemp. Willow branches are used for fascine work and for mattresses, while larger straight pieces are used for stakes, of which thousands are driven for snubbing the ropes that tie the kaoliang stalks in place. The kaoliang stalks (a kind of sorghum) are similar to our corn stalks or southern cane. They average nearly 10 ft. in length and are used with roots on, only

the seed head having been removed. When packed tightly in place in their cradles of 40 to 50 large hemp ropes with a thousand workmen jumping on a section 49 ft. wide by 33 ft. long, they settle rapidly into deep water and resist erosion as contraction of the break goes forward.

To facilitate the work of tying back the sustaining ropes of a kaoliang pak it is necessary to place on it earth to a depth of 2 to 3 ft. after a layer of kaoliang has been compacted to about 3 ft. in depth. The upstream edge for about 2 ft. back from the face, however, is always protected by kaoliang stalks with roots facing the outer edge.

Aside from the ropes that are used to act as a cradle to support the kaoliang as it is being put in place, other long ropes are used outside of each 33-ft. section much as a breast strap is attached to tugs for a draft horse. These long ropes are anchored well along the dike and hold the kaoliang core together as a monolith. So expert have the "river police" of Shantung and Hopei Provinces become in the use of these materials and these methods that the work proceeds without a hitch until near the end, when velocity of flow becomes much greater and scouring becomes serious.

A cut-off relieves the pressure

It is at this stage that the cut-off channel (excavated here by 20,000 workmen using picks, shovels, wheelbarrows and basket with poles) plays its part. If the entire river has left its bed, as was the case in this instance, then the old channel is badly silted and the new cut-off channel must act as a "primer." After the final 130-ft. section was well along and the stone sausages, in willow fascine casings, had been placed in the opening lengthwise of the stream to a point that caused heading-up of nearly 3 ft., the cut-off channel was opened to reduce the head at the closure work and induce flow in the direction of the old river bed and the cut-off channel.

The filling in of the 130-ft. gap was done in a week by the use of 1,000 sausages, varying in length from 16 ft. to 50 ft. These were rolled in from long platform boats anchored in the gap and from the two dike ends. The water in the remaining opening was from 22 ft. to 33 ft. in depth, and a flow of more than 17,645 sec.-ft. was being dealt with on the start. This work proceeded night and day in order to effect closure before scouring should become unduly deep.

Fascine-cased stonework

The willow fascines were made in a special yard conveniently located on the river and brought down by boats as needed. Small willow branches were

MAKING WILLOW FASCINES 50 ft. long in a yard located near the river.

A KAOLIANG PLUG being fitted into place against a flow of 15 cubic meters per second.

Right—DUMPING A WILLOW-STONE "sausage" into the final closure with water at high velocity.

AN 8-MAN STONE flapper being used on dike at Tung-Chuang.

used in making these, no branch exceeding an inch in diameter. Each fascine was tied at 3-ft. intervals with No. 16 iron wire and made into a bundle of nearly uniform diameter of about 8 in. These were made the length of the "sausage" required, and on reaching the job were placed close together parallel to the flow through the gap at the end of the dike or on the platform of the boats. Four or five of these laid side by side made the base of the "sausage" and hemp ropes 1 in. in diameter, spaced 3 ft. apart, tied them together. Then stone was carefully placed on this base to a height and width of about 2 ft. Other 8-in. fascines were placed along the sides and top and then the ropes were tied around the whole, making a long willow-cased body weighing several tons. Meanwhile a heavy hemp rope had been tied through the "sausage" to the several binding ropes, and this rope was anchored well back on the upstream face of the dike so that when the "sausage" was rolled into the gap it would be held in place. In actual practice the swiftly flowing water caused a number of these tie ropes to break and the sausages went down stream from 150 to 300 ft. Later two 2-in. ropes were used, and toward the last, after a head of nearly 6 ft. had been developed four ¼-in. wire cables were used.

The final closure was thus effected by this "contraction" method against a head of 6 ft. of water, though the flow had been gradually cut down as increased heading up caused increased scouring velocities down the old river channel. Immediately the last sausage was rolled in place hundreds of workmen rushed in bags of earth and completed the job of returning the river to its old bed.

Leakage was heavy for a day or two, until the load of sandbags and earth rapidly piled on top finally weighted down the willows and filled many of the voids. More sandbags on both upstream and downstream faces were used to complete the waterproofing, which was finally accomplished by the completion of the secondary dike with kaoliang core and the earthfill section between 33 ft. in width. A further earthfill in the back face of the secondary dike sealed off all remaining leakage, giving the muddy water in front of the closure dike opportunity to drop its silt load and tighten up all voids.

Both the use of stone sausages and the stone riprap front toe laid on willow mattresses, modern improvements over old Chinese methods, were worked out by H. Y. Kung, who applied them two years ago at the Fen Lo break repairs and a year ago at the Kwan Tai repairs up-river from this work. These were major reversion projects successfully carried out, though in neither case was the entire flow of the river out of its bed as in this instance. The work just completed is the most difficult that has been carried out since we built the rock-fill dam from a pile trestle on the lower Yellow River at Kungchiapa near Litsin Shantung in 1923, the planning of which was done by the writer.

25,000 men at work

This project has cost approximately $800,000 U. S. A working force of nearly 25,000 men was employed at the peak of the work in early March; more than 1,400,000 cu.ft. of stone were brought to the job 70 miles by boat after coming 100 miles by railway, and then transferred by ox-cart and light railway by hand tramming six miles to the river bank. One-man stones were used throughout. Nearly 300,000 large burlap bags filled with clay and silt were used, and 15,000 tons of dry kaoliang stalks went into the core of the closure dike. The willows used in the fascines and in mattresses supporting the stone toe fills weighed 4,500 tons. Hemp rope totaled 1,000 tons, while the iron wire from America that went into the job was 2,000 tons. No less than 90,000 willow stakes were used to anchor the ropes and wires in the kaoliang pak work. The earthwork in the dike construction totaled 24,700,000 cu.ft. while the hand excavation of the cut-off channel entailed the moving of 19,519,000 of clay and silt.

The machinery used consisted of two small centrifugal pumps for unwatering excavation and throwing 3-in. streams, plus two miles of 2-ft. gage light railway and a hundred light dump cars for transfer of sandbags, etc. Most of the local transport was done by wheelbarrows. The stone came in by Yellow River junks of various patterns that used sails to return upstream or were pulled by towlines. Native picks, shovels and wheelbarrows were the chief implements used. Even the wire cables and the hemp ropes were twisted on the job by native hand-operated twisting frames. Altogether the work was a triumph for hand labor in a country where cheap labor is ready at hand.

The undertaking was paid for by the National Government of China and carried out by a special organization, the Yellow River Conservancy Commission, formed for the purpose of handling this project. Its chairman is H. Y. Kung, who was chief engineer of the project. He was assisted by N. K. Woo, engineer in charge, H. Y. Chang, assistant engineer in Kaifeng office, and Sig. Eliassen, assistant engineer in the field. The writer was consulting engineer in the field, representing both the Shantung government and the Yellow River Commission on this project.

Oregon Plans Study To Formulate Highway Program

A SURVEY of Oregon's highways to formulate a long-range highway program was started on April 1, and according to R. H. Baldock, state highway engineer, the project will ultimately employ 250 men, with the federal government providing $250,000 and the state $50,000 of the necessary funds.

The study is to select a state-wide highway system, with all improvements planned as to priority for the next twenty years. Present conditions of highways are being noted, along with the cost of improvements necessary for maximum use. A budget will be prepared to indicate the amount of money available for highway work during the twenty-year period and the sources from which it will be obtained. All county roads and bridges are being mapped and a study made of the territory served by each road and its availability to farmers. The survey will also include a state-wide traffic count to determine the classifications of vehicles using the highways, such as passenger cars, trucks and buses, and the origin of such traffic.

CURRENT NOTES ON SEWAGE DISPOSAL

An analytical summary of recent developments for the engineer, research worker and plant operator

Conducted by
Dr. Willem Rudolfs

● BACTERIAL REDUCTION IN ACTIVATED SLUDGE

When sewage is first aerated a considerable reduction of bacteria takes place but when aeration is continued the numbers of organisms may increase. It has been assumed that bacterial reduction in the activated sludge process continues regularly from the time the sewage enters the aeration chamber until it leaves. Lojander (Proc. Finnish Society Duodecim, 17,2) determined the rate of bacterial reduction in four different types of aeration tanks at Helsingfors. The tanks consisted of (1) narrow ridge and furrow, (2) wide tanks with very high ridges and direct aeration from the bottom of the troughs, (3) wide tanks with high ridges and aeration near the top of the ridges, and (4) spiral flow tanks with paddles. In all cases bacterial reduction was rapid during the first stage of aeration, but an increase in numbers was frequently observed in the later stages of aeration. From the standpoint of bacterial reduction (in favorable cases more than 99 per cent) the special types of tanks, 2 and 3, proved to be the most advantageous in regard to reduced aeration time and quantity of air used.

● IMPROVING ACTIVATED SLUDGE WITH INERT MATERIALS

One of the essential conditions for the successful application of an activated sludge process for the purification of sewage or trade waste is the production of an activated floc sufficiently heavy to separate from the purified liquor by sedimentation in a reasonably short time. Various types of activated sludge settle slowly or produce a bulky mass. The addition of various chemicals and inert materials has been tried to induce more rapid settling and produce greater compacting of the sludge. Whitehead and O'Shaughnessy (Surveyor, March 13, 1936) report laboratory and plant-scale results with inert materials introduced in the aeration chambers where they were incorporated into the floc. Of the many substances tried separately it was found that red marl (added to the amount of 25 per cent of the dry matter in ordinary sludge) produced a remarkable brilliant effluent and yielded a sludge which settled out rapidly to a dense and well compacted mass. Adding 25 per cent of calcium carbonate in addition to an equal quantity of marl improved the clarifying power still more. The authors conclude that the gelatinous mass of an activated sludge floc is a web or net designed to arrest fine particles floating in the water: If the particles are organic the bacteria will feed on them but if they are inorganic in character the bacteria will grow on them and this in turn weighs down the floc. Of particular interest is the statement that the organisms will reject inorganic particles which are above .02 mm. in dia. Similar experiments made in this country with inert materials such as road dust, confirm the above findings in several instances but failed to do so in others.

● REMOVING CARBON DIOXIDE FROM SLUDGE GAS

Sewage sludge gas consists approximately of 30 per cent carbon dioxide and 70 per cent methane but ordinarily it also contains a certain amount of water vapor. For some uses, where corrosive action must be inhibited, it is desirable to remove all or part of the CO_2; when the gas is used as motor vehicle fuel the two diluting substances, water vapor and CO_2, should be eliminated. A variety of simple methods to effect this purpose are available. Pollock (Ann. Rept. City of Johannesburg, South Africa, 1935) studying the use of sludge gas for use in motor trucks concludes that attempts to secure removal of CO_2 by liquefaction are not advisable because the amount of gas removed as liquid is determined by vapor pressure and at ordinary temperatures only 40 per cent of the existing CO_2 can be obtained. A more feasible scheme is to dissolve the CO_2 in water by means of high pressure spray—at a pressure of approximately 70 lbs. per sq. in. the carbon dioxide content can be reduced to about 0.5 per cent. A third method consists of chemical treatment using lime and/or caustic soda but the required apparatus and reagents are rather expensive because of the large amount of CO_2 to be removed. For use as a fuel to operate stationary gas engines, sludge gas can ordinarily be used directly without any preliminary scrubbing.

● STIRRING IN DIGESTION TANKS

It is well known that slow stirring or occasional mixing of ripe digested sludge with the incoming fresh solids is beneficial to the digestion processes. The question has been raised frequently whether nearly continuous stirring or frequent intermittent mixing for short periods is better than mixing once a day. Extended observations made by Ardern and Lockett (*Proc.*, Institute Sewage Purification, 1935, 99) have afforded no evidence that mixing for 5 out of every 15 min. during the 24 hours of the day offered any marked advantage over the ordinary procedure employed by them, in which circulation was practiced for only 30 min. each day immediately after the addition of fresh sludge. Their results were obtained with mixtures of activated sludge and fresh solids digested under both mesophilic and thermophilic conditions. The 30-min. stirring period gave all the mixing and circulating required in addition to that caused by gas evolution and convection currents normally present in a digestion tank.

● STEAM-HEATING SLUDGE TO AID DEWATERING

Because sludge disposal remains one of the major problems in sewage treatment, new schemes for simplifying disposal are frequently proposed. Trial installations employing steam heating of primary tank sludge previous to filter pressing are under investigation in England at Waddle Valley, Halifax, Sheffield and Bradford. The impressions of a visitor to the Waddle Valley plant who inspected this latest scheme, known as the "Porteous Process," are given in The Surveyor, March 31, 1936. In brief, the method consists of heating sludge in a boiler to a high temperature under steam pressure, and then dewatering the product in filter presses. The sludge after steam treatment can be pressed in about half an hour as compared with the usual 8 to 12 hour period following chemical treatment. The moisture content of the cake is said to be 40 per cent; the cake is hard and has no unpleasant odor. No figures are given but the cost is said to be relatively small. Approximately two-thirds of the volume of the sludge is drawn off in the form of a brownish-yellow supernatant liquor before pressing. It is claimed that during the steam cooking process no objectionable sewage odor is present although the liquid discharged "is certainly not odorless." The cake is suitable for use as fuel or fertilizer.

Basic Principles of Incineration—II

Good practice requires proper consideration of refractory linings, grates and air supply, the essential elements for maintaining temperatures that assure complete combustion.

THIS IS the final article by Mr. Very outlining his conclusions on incinerator design after 30 years of practice in the field of municipal waste disposal. The first article, appearing last week, was a discussion of garbage and rubbish as a fuel material. This installment deals with refractories and heat control. EDITOR.

By Edward D. Very
Civil Engineer,
Teaneck, New Jersey

INCINERATORS for the disposal of municipal refuse are designed to burn a fuel of special characteristics and if they are to be successful in operation particular attention must be directed to certain features of furnace construction and provisions for heat control.

Garbage and rubbish, as detailed in a previous discussion (*ENR*, May 14, 1936, p. 687), is a low-grade fuel combination that should be analyzed and treated according to established methods for fuel burning generally. To assure complete combustion of this material it is essential to develop and maintain definite critical temperatures by means of auxiliary air supply, grate design, and firebrick linings. It is the purpose of this article to describe and evaluate these features of incinerators, not with the intention of suggesting a standardized design, but rather as an interpretation of developments and their relation to effective operation.

Refractories

Refractories, which in this case mean firebrick linings, are of primary importance in all gas passageways to "withstand, without physical or chemical change, high and changing temperatures, action of flame or gases and mechanical stresses due to charging and manipulation of the fuel-bed" and of equal importance, to conserve heat for the maintenance of high temperatures within the furnace. The brick is composed of fire clay which is predominantly a mixture of silica and alumina and possesses not only the characteristic of refractoriness but also of practical infusibility; the former is necessary for protection to the structural elements of the furnace, the latter contributes to the stability of the lining.

Firebricks are graded for the several purposes for which they are intended. Strangely enough, the higher the quality the softer the brick. As a casual test of quality, breaking a brick and examining the fracture serves: If the surface of the fracture shows a fine and uniform texture, as of broken bread, it indicates low grade; if the surface appears open, clean, white and flinty, it indicates better quality.

The brick that is used for the burning and combustion chambers of an incinerator should be the so-called "first quality brick," having a fusion point of approximately 3,000 deg. F., a compression strength of 7,500 lbs. per sq.in., a relative hardness of approximately 4 (in the standard scale wherein 10 indicates brittleness and a tendency to crumble) and the nodule structure should range from medium to medium large and their ratio high to medium. This quality of brick is peculiarly adapted to the requirements of the burning and combustion chambers because it has a comparatively low surface resistance to heat—it will absorb the heat generated from the burning fuel and also release it by radiation to the gases and fuel-bed; the relatively low degree of hardness is important because it prevents spalling due to abrupt changes of temperature caused by frequent opening of charging and stoking doors.

For the flues and chimney the lowest class of first quality brick may be used wherein the fusion point is lower, compression strength higher, relative hardness up to 6, size of nodules medium to medium high and ratio medium to medium low. This brick is more satisfactory for flues and chimney because heat storage and radiation are not of such prime importance but resistance to the erosive action of the dust laden gases eliminated in the stock above the base is of real concern. Even here, however, the degree of hardness must be reasonably limited because of the danger from spalling due to abrupt temperature changes caused by the opening of clean-out doors.

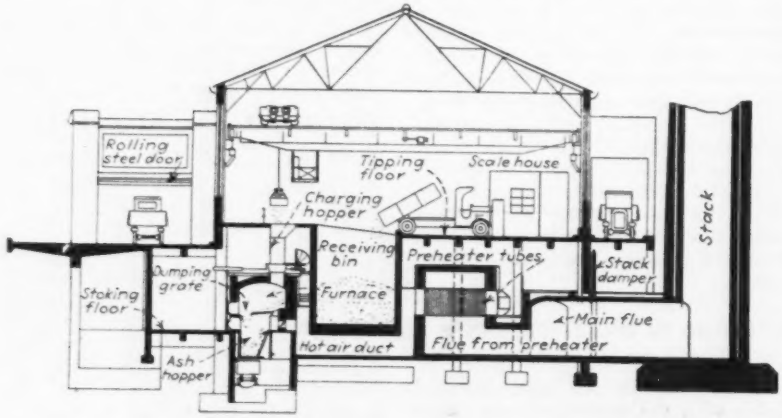
The property of "acid resistance" is an important characteristic to be sought in furnace brick for garbage may contain all kinds of acids which are concentrated by heat and therefore are quite likely to have an intensely corrosive effect.

For structural reasons choice should be made of fire-brick whose expansion co-efficient is reasonably low, possibly not to exceed 0.05 in. in a 9-in. brick. In the event that the height of the walls in either chamber of the furnace creates a greater compression load than the first quality bricks are able to withstand, the lower portion of the walls may be constructed of lower quality brick since the demand for heat absorption and radiation is most important in the higher portion of the walls where the major stream of hot gases pass.

In laying up furnace brick it is generally considered best practice to use a jointing cement made from the same clay as was used in the manufacture of the brick (high temperature cement has its advocates, but I am unconvinced). If this is done there will be no eccentric stresses due to differential expansion. The purpose of fire clay cement is to fill up uneven surfaces of the brick and it does not function as ordinary mortar. For this reason it is mixed in almost fluid condition, the bricks are dipped in it, shoved into place, and set by tapping to close contact.

Of fundamental importance in the effective operation of a refuse incinerator are the provisions made for heat control.

CROSS SECTION of an incinerator plant showing one method of handling refuse and the general scheme of operation.



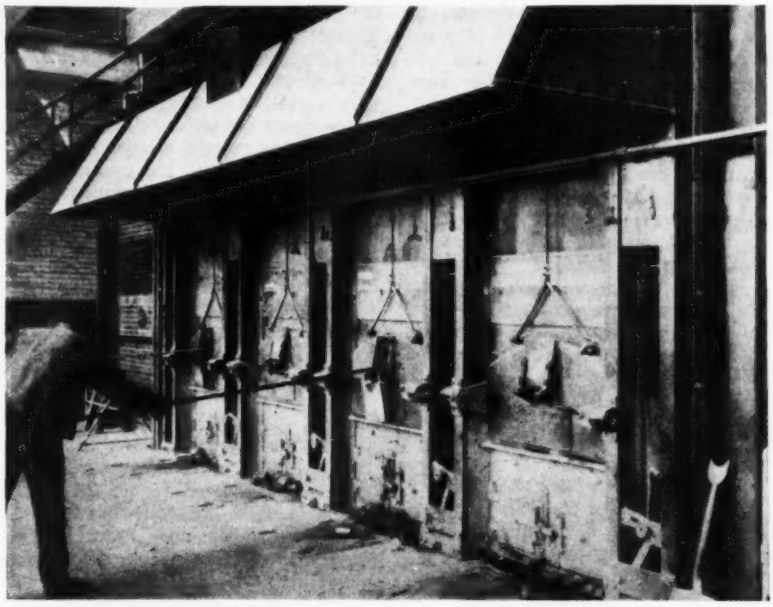
In this category are included forced draft, pre-heating of air, control of air at intake, grate design and secondary air supply—these are the means for attainment and maintenance of proper temperatures within the furnace.

Forced draft is used in order that the rate of combustion can be governed to produce sufficient excess heat within the furnace above that lost by conduction through, and radiation from, the walls. Since we are dealing with a fuel of continual variation in quality and consistency, a fluctuating amount of air is required not only to support combustion but to compensate for the variable resistance to draft pressure. For this purpose a fan is used whose capacity is sufficient to supply the maximum volume required and which can furnish a "static pressure" up to, but not materially exceeding, the equivalent of 3½ inches water column. Constant pressure fans have been developed to meet these requirements satisfactorily. Some designers advocate the use of variable speed motor-driven fans but in my opinion they are not needed for this type of operation, principally because sufficient draft control is provided at the air intake of the furnace. Furthermore the regulation of motor speed requires the type of attention and judgment not usually available in the operating personnel.

A forced draft fan should be designed to do no more than cause air to pass through and just over the fuel-bed. From this point the chimney should take up the burden of carrying off the gases generated. Such an arrangement tends to eliminate the excessive agitation of the dust contained in the fuel with its subsequent entrainment in the gas streams and eventual emission from the chimney. This dust nuisance is equally as offensive as noxious gas emissions. Under the comparatively moderate force of natural draft, and with adequate provisions for abrupt changes of direction of gas flow, dust may be separated from the gases by centrifugal action for deposit in the combustion chamber flues and at the base of the chimney. There is another advantage in changing the direction of gas flow because this causes a thorough intermixture of gases which mutually assist each other to promote complete combustion.

It has been found that the construction of a sump in the floor of the chimney immediately under the shaft is a good way to secure freedom from dust emissions; experiments have shown that the amount of dust deposited increased as the sump was deepened, but data as to exact depths for various furnace capacities is lacking.

Proper forced draft fan design will also eliminate the danger of spark emissions from the chimney. However, most designers feel that the positive method to prevent spark discharges is to use a screen to catch the heated particles so that they will be retained until consumed in the hot gases; some designers advocate "checkerboard" transverse firebrick walls in the flues for this purpose and others use a cast iron grid at the flue entrance to the chimney. My preference is for the latter because the "checkerboard" tends to impede the gas flow, causing an acceleration of velocity and eddies which stir up dust deposits.



STOKING A FURNACE to secure even distribution of material over the grates and thus aid the completion of combustion.

Pre-heated air

The pre-heating of the air to support combustion is highly important because it provides the heat element required for the chemical reaction necessary for combustion as well as accelerating ignition of the fuel. Primarily, it is an economical utilization of waste heat resulting in material increase in the rate of burning. The device for pre-heating air is generally a metal box containing a number of tubes (usually of cast iron), set vertically in a structure located between the fan and furnace. Hot gases, diverted from those flowing to the chimney, are caused to flow through the tubes while air, usually taken from the stoking room by the fan, passes around and between the tubes. The best practice seems to be to design for a downward flow of the hot gases since that is the natural course for fluids giving up heat. The most effective temperature for pre-heated air for draft purposes is approximately 300 deg. F.; 400 deg. F. is about the maximum for effective results.

There are some who argue that the added expense for the installation of a pre-heater is unwarranted because the necessity for its use is not continuous and they recommend the use of an auxiliary fuel as a substitute. I agree that as a matter of dollars and cents coal would be the more economical, but I am by no means convinced that the results are at all comparable to those provided by pre-heated air, because no such complete inter-fuel intimacy can be obtained.

Control of air at the furnace intake is usually provided by causing the inflow piping to terminate at a cast iron collar set in the ash pit wall below the grate level. This collar is ordinarily provided with a butterfly valve actuated by a lever rod that extends to the front of the furnace and arranged to be within easy reach of the stoker. By this means the inflow of air to the furnace may easily be varied subject to the fluctuating requirements. In general, the simpler the design of this device the more effective will be its use. In some cases elaborate devices for almost micrometric adjustments are provided but these are unnecessary.

Grate function and design

Grates are designed to support the fuel bed, retaining it without loss of combustible matter until the fuel is entirely consumed. At the same time the grate should permit a full and free flow of air to support combustion through the fuel bed. Ordinarily, grates consist of a cast iron grid or a set of individual bars; stock patterns of grids, especially of the herringbone type, have not proven satisfactory. Single bars with lugs cast on to form spacers are not only effective but also preferable because of the ease with which individual bars may be removed and replaced without displacement of the others in the set. Formerly, when ashes were used as an auxiliary fuel perforated plates were thought necessary in order to retain finely divided combustible material; however, the adoption of rubbish as the auxiliary fuel obviated this requirement and this type of grate has been generally discarded. Objection to their use was also due to the fact that

they increased frictional resistance to air flow and thereby prevented intimate distribution of air through the fuel. It seems obvious that slots extending from front to rear, spaced as closely as the fuel supporting feature will permit, offer the best means for proper diffusion of air through the fuel.

The single grate was used in all of the earlier furnaces and is still employed in some installations. The dimensions of the grates are governed by the ability of a stoker to reach and manipulate the entire fuel bed through a stoking door opening; the practical limit of dimension in both directions is probably six feet or possibly eight feet from front to rear and six feet transversely.

The merit of multiple grates

The use of single grates on both sides of a centrally located combustion chamber was the next development. This arrangement having proved unsatisfactory, an extension of the single grate into a series of grates parallel with the front of the furnace was adopted. This design, known as the "multiple grate" has much merit. In an installation of this type the upper surface of the entire series of grates is unbroken and appears as one unit. The ash pits beneath, however, are divided by walls so that each equivalent area of a single grate receives air supply, fresh charges of fuel and ash removal as though it were entirely independent of the other sections. Each section also has its individual charging and stoking opening. Thus for all intents and purposes multiple grate installations act as separate units except that in the common burning chamber, there is an intermixture of the gases from areas where fuel is in various stages of burning. This is of considerable advantage because gases in the more advanced stage of combustion intermix with and assist those in the less complete stage while the heat generated by all sections is distributed to the refractory linings, thus giving the entire fuel bed and gaseous products from all sections the full benefit of radiation. Furnaces providing this feature alone are improperly referred to as the "mutual assistance" type—true mutual assistance furnaces include other features as well.

At this point it is well to consider and discuss the so-called "drying hearth." This is a solid fire-brick platform (dimensions vary with the individual designer), on which the fresh materials are first deposited when charged into the furnace. Its use is based on the idea that for economical as well as effective operating results, some degree of dehydration is necessary before refuse is spread on the fuel bed—this is a controversial point.

The evolution of the drying hearth apparently came about as follows: In the earlier furnaces a separate chamber, located between the burning compartment of the furnace and what was intended as a combustion chamber, was dimensioned to be capable of containing a large amount of heaped up garbage (rubbish was not utilized). For the floor a grating was provided so that the water, expressed from the material by its own weight, might discharge into a compartment below. Hot gases from the burning refuse were diverted to evaporate the discharged liquid but this converted the residue into a gelatinous mass that was difficult to remove. The open grid feature was then eliminated in favor of a fire-brick platform flooring. It was thus intended to cause hot gases from the fuel bed to pass over and around the piled up material so that it would be dried sufficiently to make it practically auto-combustible.

In the development of later designs the drying hearth feature has been incorporated in modified form; these vary from a platform, centrally located in the burning chamber and surrounded by grates, to less extensive platforms (some in duplicate) located either adjacent to the bridge walls or scattered as alternates to grate sections lengthwise of the burning chamber. There is also one type having a fairly narrow ledge, 30 in. to 36 in. in width, located at the rear of multiple grate sections.

Drying hearth value questioned

May I interrupt the continuity of thought here to note my objection to the principle of storage of any considerable quantity of fresh materials within the furnace—I feel that this tends to impede the progress of the combustion action. My experience has demonstrated that drying hearths are comparatively ineffective in obtaining the desired result because the drying effect is quickly inhibited by the insulating coat of ash resulting from surface combustion and consequently heat does not penetrate through the mass. Such a platform is justified if used for storage of materials so that they are within easy access to the stoker, to be drawn on as maintenance of the fire-bed may require. There are, however, many sincere advocates of the drying hearth feature and my recommendation is that the interested reader give their contentions serious consideration before drawing conclusions.

Means for the introduction of a secondary air supply above the burning grates is rarely provided in furnace designs. Leakage of outside air through door openings and crevices at door frames, as well as the excess air that may find its way through the fuel bed, have been considered sufficient to supply the demand. At best these are crude arrangements of no credit to designers but unfortunately there has been no particular effort displayed to make improvements in this regard. In the interest of continued progress it may be well to give some consideration to this point. Although there are many possible methods by which this supply may be introduced, this in itself is not enough for there should also be provided a means for its control. I have seen but one device in operation that combined both supply and control features—that was at the Washington, D. C., plant where flap doors, occupying practically the entire front wall of the burning chamber above the furnace fronts, open and close automatically under rheostatic control to conform with predetermined temperature limits. While this seems to be a successful solution of the problem I believe that the air supply would be more effective if introduced at a point where the hot gases flow in a thin sheet over the bridge wall. This could be done by installing a pipe through the entire length of this wall fitted with air jets spaced at frequent intervals. This pipe should be connected with the primary air piping and the supply could be regulated by a valve automatically controlled by a rheostat.

While the attainment of proper temperatures is effected by the use of forced draft and pre-heated air, the maintenance of such temperatures depends in large measure on the heat stored in and radiated from the refractory linings. In addition to radiation, convection currents also serve as a heat transmitting agent although their rôle is comparatively minor. These are all mutual assistance features. There is also the catalytic action resulting from the "wiping" of the gas stream over the surface of the refractory lining. It is important, therefore, that the refractories are of highest quality if they are to function to best advantage.

The matter of providing ample space volume in the burning and combustion chambers and ample area in flues and chimney while not apparently directly concerned with heat control has a material effect, because they prevent restriction of expansion as well as the retardation of outflow of the gases and thus permit progressive combustion action to proceed until completed.

Summary

No mention has been made of the water-jacketed furnace design, because I am thoroughly convinced of the value of refractory linings for all gas passageways and thus feel unable to present the water-jacket design in an unbiased manner. The water-jacketed furnace has able advocates and I refer the reader to designers of this type—their claims merit consideration in order that unilateral statements may not go unchallenged to the reader's disadvantage.

In this discussion of the essential features of a modern incinerator there are but two controversial points—the value of a drying hearth and the water jacket. Except for these we may accept as proved requisites: (1) a forced draft fan capable of affording constant pressure combined with required volume of air under the variable conditions encountered in operation; (2) a pre-heater available when required to supply the complement of heat

which the fuel may need for its complete combustion; (3) a neutral point above the fuel bed where the pressure of forced draft shall be non-existant and that of natural draft utilized; (4) a valve control of the inflowing air, to support combustion; (5) carefully designed grates, single or multiple as the designer's preference may be inclined; (6) first-quality refractory linings for all gas passageways, with slight variation in class according to specific gravity; (7) secondary air supply with automatic control and (8) ample volumetric provisions in the furnace and combustion chambers and ample areas in flues and chimneys. No one of these requisites is predominantly important but all mutually assist in the attainment of satisfactory results.

If I were asked to name a plant wherein these fundamental features are incorporated in their entirety I could not do so although there are many plants that utilize some of them. To the further query as to why this is so, my only answer would be that it is due to the prevailing custom of awarding contracts to the lowest, but not always most responsible, bidder. For this reason contractors will present designs stripped of all features that may be considered as "frills" and which are neither demanded nor appreciated by municipal officials. The only remedy to this situation will come through more general understanding of the basic principles of incineration.

Letters to the Editor

Light Metal Bridge Railings

Sir:—In several past issues of *Engineering News-Record* the subject of bridge handrailings has been discussed, with particular attention to light metal designs and factors of appearance and safety. Our experience with handrail designs of this type might be of interest to your readers. The accompanying photographs show bridges which have been built in Wichita city parks in the past three years, using an open-type steel handrail which was adopted because of complaints from motorists that they could not see the river with the heavier concrete railings previously used.

On the 13th St. Bridge built in 1932 the vertical members of the handrailing are ¾-in. square rods in 6 ft. long panels set in a concrete coping or curb 9 in. deep. This curb is anchored to the sidewalk with dowels. The precast concrete posts were set in place in halves and the core filled with concrete. Each post is anchored to the walk with four ¾-in. dowels. The top longitudinal member is a standard rolled section, often used for steel stair railings, and extends into the concrete posts for anchorage.

On the 11th St. Bridge built in the fall and winter of 1934-35, the handrail is made up of ¾-in. square bars for the vertical members, welded to a 2 in. channel for the lower longitudinal member and a 1-in. angle for a spacer at the top. Both upper and lower longitudinals extend into the metal posts enough for support and are attached to the concrete posts by angles and anchor bolts. The intermediate metal posts consist of two 6-in. channels with the flanges welded together; holes are punched for the 2-in. channel and the 1-in. angle. Four ¾-in. dowels are set in the walk at east post. The 6-in. channel is continuous over the metal posts between the tall concrete posts and is attached to both by bolts. Lights are set in the top of the tall concrete posts about 7 ft. above the sidewalk. The lamps and reflectors in these units project the light downward and across the walk and roadway, giving a soft light with no glare to passing cars.

The Bitting Ave. Bridge was begun upon completion of the 11th St. Bridge, and its handrail is similar. The top 6-in. channel of the railing is attached to the concrete posts by being bolted to a 3-in. channel cast in the post. The bottom 2 in. channel is anchored to the concrete post by being bolted to a 1½x1-in. strap iron extending through the post. Although it might be possible for sufficient impact to occur to shear the bolts attaching the longitudinal members, there would still be left the flanges to be caught on the 3-in. channel and the strap iron.

The panel length of the handrails in all three of these bridges in no case exceeds 6 ft., and it would be a rare occurrence for a car to climb the 8-in. curb and not be resisted by at least two of the well-anchored posts.

These bridges were designed and constructed by the engineering department of the city of Wichita, P. L. Brockway, city engineer.

L. K. WHITE,
Wichita, Kan. Assistant City Engineer.

THREE TYPES of light metal handrailing used on bridges in Wichita, Kan. The Bitting Ave. bridge is at the top; the 13th St. bridge in the middle and the 11th St. bridge at the bottom.

Book Reviews and Notes

A Monthly Commentary on Current Additions to the Civil Engineer's Library

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Materials Textbook Revise

MATERIALS OF ENGINEERING—By Herbert F. Moore. A textbook; cloth; 6x9 in.; pp. 419; photographs, linecuts, tables. Published by McGraw-Hill Book Co., New York and London. Price $4.00.

THE FIFTH REVISION of Professor Moore's concise elementary textbook on engineering materials records the new knowledge of materials that has been gained in laboratory and field since the 1930 edition. New matter includes a chapter on the failure of materials by corrosion and wear, and additions to the chapter on failure by fracture, also added information on the use of yield strength as a criterion of the failure of elastic properties in a material. The chapter on creep has been largely rewritten. Concise tables give the principal characteristics of the many plastics that have come into wide use in recent years.

Architectural Standards

ARCHITECTURAL GRAPHIC STANDARDS—Second edition. By Charles George Ramsey and Harold Reeve Sleeper. Cloth; 9x12 in.; pp. 284; linecuts. Published by John Wiley & Sons, Inc., New York. Price $6.00.

THE ADDITION of over 50 new plates has greatly expanded the usefulness of this book to those who have anything to do with building construction. Made up entirely of plates, the book contains a wealth of information that is difficult to find quickly, such as standard dimensions for steel sash, space required for building services, dimensions of tennis and handball courts, turning radii for motor vehicles, and the minimum requirements for access drive, as well as the many normal details of building construction that are looked for in such a book.

Electric Utilities in the U. S.

PRINCIPAL ELECTRIC UTILITY SYSTEMS IN THE UNITED STATES—POWER SERIES NO. 2.—Made by the National Power Survey, Federal Power Commission. Cloth; 9x12 in.; pp. 90; tables, maps. For sale by the Federal Power Commission, Washington, D. C. Price $1.00 (paper), $1.50 (buckram).

IN THIS STUDY of the electric utility systems of the United States the Federal Power Commission, acting through the National Power Survey, has attempted to set forth the complicated interrelation between the power companies serving this country. The 57 principal systems and 50 minor systems covered by the report have 90 per cent of the installed capacity of the United States and supply 92 per cent of the energy. A large colored map accompanies the report and gives the areas served by the principal systems; a large diagram gives corporate interrelations. Tables give the physical and operating characteristics of the companies and details of various services.

Bridge Welding Specifications

SPECIFICATIONS FOR DESIGN, CONSTRUCTION, ALTERATION AND REPAIR OF HIGHWAY AND RAILWAY BRIDGES BY FUSION WELDING—Paper; 6x9 in.; pp. 66; linecuts and tables. Published by American Welding Society, 33 W. 39th St., New York, 1936. Price $1.00.

THE FIRST STEP in remedying a situation which has steadily become more confused has been taken by the American Welding Society in publishing a specification for welding highway and railway bridges. Heretofore, anyone wishing to use welding for joints in dynamically loaded structures has been at a great disadvantage, lacking both base and beacon for his reasoning. The new specification thus will fill a real need. Prepared by an able and representative committee it expresses the best available judgment on both design and welding procedure. It is based on all the relevant research results that could be obtained from foreign countries as well as the United States. The new specification is offered as a stopgap and a guide until more intensive and integrated research can be inaugurated. Its most important contribution lies in the recommendations made with respect to unit stresses and required areas for joints subjected to pulsating and reversed stresses; formulas are presented as part of the specifications and an appendix develops the subject in more detail.

Covered Bridges

OLD COVERED BRIDGES—By Adelbert M. Jakeman. Cloth; 6½x10 in.; pp. 107; photographs. Published by Stephen Daye Press, Brattleboro, Vt. Price $2.50.

THOSE WHO NOTED WITH REGRET the passing of old covered bridges in the recent floods will be interested to know that this early type of engineering structure is not as nearly extinct as many believe. Although Mr. Jakeman, in this book, does not attempt to enumerate all the covered bridges in the country, he states that the number still in service in New England runs into hundreds, and that one photographer recently took pictures of nearly 300 such bridges in Ohio and part of Kentucky. Mr. Jakeman's book is one of historical rather than engineering interest, but one fact that he brings out will be of interest to engineers, namely, that many of New England's covered bridges are not as old as is generally supposed. Instead of being "over 100 years old," many of the bridges are but half that age, having been built in 1870 or 1871, after the disastrous flood of 1869. One bridge of this type was built as late as 1906. Mr. Jakeman gives detailed attention only to existing bridges in Massachusetts and Connecticut.

Drought Years

DROUGHTS OF 1930-34—Geological Survey Water-Supply Paper 680, by John C. Hoyt. Paper; 6x9 in.; pp. 105; maps, charts, tables. For sale by Superintendent of Documents, Washington, D. C. Price 20c

IT IS CERTAIN that the occurrences of the great drought sequence that fell in the five years 1930 to 1934 will long constitute basic data for estimation of minimum water supply in the United States. In respect to rainfall, riverflow and underground storage alike, continuous records that in different regions range from 50 to more than 150 years mark this five-year sequence as extraordinary in both extent and intensity of water shortage. It needs nothing more to establish the importance of a compilation of the water facts of this period, such as contained in John C. Hoyt's Geological Survey monograph. This work should be on the bookshelf of all engineers interested in water problems.

The onset of the drought in 1930 brought new low figures of annual precipitation in no fewer than 11 states; together the three years of 1930, 1931 and 1934 established all-time lows in 17 states of our 48. While the early part of the period affected mainly the humid states, the closing year centered its disastrous effects on the semi-arid and arid western half of the country. It should be added that accumulated deficiencies of supply contributed largely to the damage done by the 1934 shortage in the west, and that for this reason the mere number of new low rainfall records does not adequately reflect the severity of the drought.

It appears, in fact, that the chief significance of the period lies in the duration of the drought. Mr. Hoyt's study emphasizes this. One wishes that more light were thrown on drought sequences, especially those prior to the measured recording of rainfall and streamflow. Prof. A. E. Douglass has reported that tree-ring records, though

they give a "strong impresion of climatic stability" over a time as long as a thousand years (in the west), show strong pulsations and indicate that every third century has seen a "very great" drought; a specially severe one extended from 1276 to 1299. Whether these observations from the upper levels of a desert plateau have any parallel in humid regions is not known, but perhaps Europe's crop records would give some answer.

The latest data of the Weather Bureau for 1936 rainfall show a severe deficiency during the first four months over an area almost as great as that affected in the corresponding period of 1934. Possibly this means that the recent drought cycle is still continuing, and that in due course we may have new data on long deficiency periods. If Mr. Hoyt's study could later be extended to deal with drought cycles and sequences by drawing on all available facts, qualitative as well as precise, the value of the data on the 1930 to '34 drought period would be increased.

Even without this, however, the importance of the present monograph is beyond question. A period that brought many new records of minimum streamflow (only to be followed by record-breaking floods within two years!), that saw Great Salt Lake reach the lowest level in the 85 years of stage readings, and that publicized itself further through its great dust storms, is assured of a place in water history. In respect to practical use, the data presented give strong support to a conservative view of water yields. Mr. Hoyt points out that though the minimum river discharges of the period will probably serve for some time as a basis for estimating low-water flows, still lower flows are possible "and even probable."

Miscellaneous Notes on Booklets and Reprints

EARTHQUAKE RESISTING STRUCTURES is the subject of a paper by Professor Edward R. Dye, Montana State College, Bozeman, Mont. The paper is published as Bulletin No. 1 of the Engineering Experiment Station.

A THESIS published (in French) by the Faculty of Sciences, L'Ecole Polytechnique, Paris, is a study of friction in pulverized mediums and a discussion of the application of the study to foundations. The paper is by Jean Lehuerou Kerisel.

A STATISTICAL RECORD of the expenditures made on inland waterways by the Canadian Government since Confederation is given in "Waterways of Canada," published by the Dominion Bureau on Statistics, Ottawa, Ont., Canada. The pamphlet covered expenditures on canals, harbors, lakes, rivers, and aids to navigation. It includes also statistics on revenues, operating expenses and traffic handled.

THE FUTURE OF ENGINEERING EDUCATION, an address by William Otis Hotchkiss, president, Rensselaer Polytechnic Institute, has been published by the institute as "Extra to Bulletin No. 4, Vol. 34." Copies may be obtained from the Institute at Troy, N. Y.

SUBGRADE DRAINAGE FOR MODERN ROADWAYS is the subject of bulletin H-36 published by the Armco Culvert Manufacturing Association, Middletown, Ohio. The pamphlet is divided into three parts, the foundation or subgrade studies, methods of subgrade stabilization, and samples of subdraining.

THE MAINE STATE PLANNING BOARD has issued a voluminous report covering the period March 15, 1934, to March 15, 1935, in a limited mimeographed edition. The report has been prepared as the basis for future planning operations and contains the first compilation of the state's resources made by any one agency.

THE DESIGN OF CONCRETE FLOOR SYSTEMS is covered briefly in an 87-page pamphlet published by the Portland Cement Association, 33 West Grand Ave., Chicago, Ill., under the title of "Simplified Design of Concrete Floor Systems." About half the pamphlet is devoted to tables. Copies may be obtained free.

STUDIES RELATING TO MARINE BORERS are summarized in a report for the period 1934-35, issued by the New England Committee on Marine Piling Investigation. Copies of the 200-page report in mimeographed form can be obtained from the committee for $1. (Care of the Boston & Maine Railroad, 150 Causeway St., Boston, Mass.)

THE RAILROADS, electric railways, motor buses, taxicabs and contract carriers, of New Hampshire, are described in Part I of Public Passenger Carriers in New Hampshire, a report by the State Planning & Development Commission, Concord, N. H. The report is issued in a limited mimeographed edition as the first of several reports that are to be consolidated into a single volume at a later date.

THE THEORY OF OPTICAL STRESS MEASUREMENTS is set forth in compact form in a booklet entitled Festigkeitslehre Mittels Spannungsoptik, published by R. Oldenbourg, Berlin, Germany. The translation of optical observations into stress results is particularly discussed. Hydraulic analogies are dealt with to some extent, and something is said on model materials suitable for photoelastic studies.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

THE CONSTRUCTION INDUSTRY: Including a List of Selected Trade Associations—Market Research Series 10.1, Bureau of Foreign and Domestic Commerce, Department of Commerce. For sale by the Bureau of Foreign and Domestic Commerce, Washington, D. C. Price 10c.

GRAPHIC METHODS FOR PRESENTING BUSINESS STATISTICS—By John R. Riggleman. Cloth; 6x9 in.; pp. 259; photographs, diagrams. Published by the McGraw-Hill Book Co., New York and London. Price $2.50.

HYDRAULIC AND ROAD QUESTIONS IN CHINA—Report by the Committee of Experts. Paper; 8x11 in.; pp. 213. Published by the League of Nations, Geneva. Available in this country through the World Peace Foundation, 8 W. 40th St., New York, N. Y. Price $1.75.

JAMES WATT, CRAFTSMAN AND ENGINEER—By H. W. Dickinson. Cloth; 6x10 in.; pp. 207; photographs, linecuts. Published by the University Press, Cambridge, England; and The Macmillan Company, New York. Price $4.00.

LITTLE WATERS:—THEIR USE AND RELATION TO THE LAND—By H. S. Person, in connection with the Soil Conservation Service, Resettlement Administration and Rural Electrification Administration. Board; 6x9 in.; pp. 82; photographs and linecuts. Published by U. S. Government Printing Office, Washington, D. C.

THE PORT OF GALVESTON, TEXAS—PORT SERIES No. 6, Part 1 (Revised 1935)—Corps of Engineers, U. S. Army. Paper; 6x9 in.; pp. 109; photographs, maps, tables. For sale by Superintendent of Documents, Washington, D. C. Price 30c.

PRAKTISCHE ANWENDUNG DER BAUGRUNDUNTERSUCHUNGEN — By W. Loos. Paper; 7x10 in.; pp. 148; photographs, diagrams, tables. Published by Julius Springer, Berlin. Price RM 11.

PRINCIPLES OF PLAIN AND REINFORCED CONCRETE CONSTRUCTION —By E. Probst. Cloth; 6x9 in.; pp. 344; photographs, diagrams, tables. English translation published by Edward Arnold & Co., London and Longmans, Green & Co., New York. Price $10.00.

RAUMVEREDELUNG DIE NEUE STADT —By Egon Riss. Paper; 6x8 in.; pp. 39. Published by Georld & Co., Vienna, Austria. Price S 2.16 (Mk. 1.20).

SEEHAFENBAU: Band III (Lieferung 5) —By F. W. Otto Schulze. Paper; 7x10 in.; pp. 61; linecuts. Published by Wilhelm Ernst & Sohn, Berlin. Price RM 3.75.

SEWERAGE—By A. Prescott Folwell. 11th revised edition. Cloth; 6x9 in.; pp. 412; photographs, diagrams, tables. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London. Price $4.50.

SHORT LESSONS ON ENGINEERING AND ARCHITECTURE (Including Supplement A)—By Francisco Gaston. Cloth; 4x7 in.; pp. 140; diagrams and tables. Prepared for students of English, School of Engineers and Architects, University of Havana, Havana, Cuba.

TECHNICAL AND SCIENTIFIC ENCYCLOPEDIA: HUTCHINSON'S — Edited by C. F. Tweney and I. P. Shirshov. Cloth; 7x10 in.; four volumes, pp. 2,468; numerous illustrations. Published in this country by The Macmillan Company, New York. Price $25.00. . . . *A British book compiled by men unfamiliar with American practice and current technical terms, especially in the civil engineering field. Some in common use are not included.*

TRANSPORTATION LINES ON THE GREAT LAKES — TRANSPORTATION SERIES No. 3, 1935—Corps of Engineers, U. S. Army. Paper; 6x9 in.; pp. 83; photographs, maps, tables. For sale by Superintendent of Documents, Washington, D C. Price 30c.

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Spring Repairs

WITH THE OTHER PERENNIALS of spring comes the frost breakup of the highways. Road surfaces that were smooth and stable for traffic when winter closed down are now widely pitted and broken by frost boils and heaved profiles. A major repair job confronts the highway maintenance engineer from the Canadian border to well below the Mason and Dixon line—for last winter's severe cold swung the frost line far south of the mark set by most of the preceding years. Indeed it is in the south that perhaps the greater havoc was wrought, and there also the restoration will be most delayed, both because past construction has not anticipated frost action and because the repair organizations and funds in that part of the country are not set up to handle frost damages. But everywhere the work of repairing the winter's ravages to roads is enormous. From a survey now being prepared for early publication by *Engineering News-Record* it is found that the costs of restoring frost-damaged roads will exceed by many millions the normal spring maintenance expenditures. This is a situation that calls for serious consideration by highway officials. Subgrade treatment, base course, and roadbed body are all involved, and it may be that full study will indicate the need of some change in current practices of road design and construction.

Broader Water Study

CURRENT DEVELOPMENTS are tending to give largely increased importance to the subject of predetermining water storage and flow. This is coming about by reason of the size of the works that are needed to store, control or utilize the water obtained from extensive regions, as well as by reason of the complexities involved in serving various water uses. In operating storage reservoirs, for example, it is necessary to look forward over a large part of the water season, in order to be in a position to predetermine administrative decisions wisely. The situation is obvious in the case of a reservoir for combined flood-protection and navigation service, where the detention of floodwaters calls for keeping the reservoir as nearly empty as possible, while supply of navigation water calls for a reservoir as nearly full as possible; but as a matter of fact quite the same situation exists wherever the flow of a stream is to be equalized, as is true of every reservoir designed for stream control. An idea of the elaborate procedure that is justified in obtaining the data for runoff prediction in such cases is furnished by the Fort Peck snow surveys discussed on another page. It is timely to keep in mind, however, that water forecasting of this kind applies not only to surface reservoirs and streamflow but also to underground storage. If the growing importance of water-resource forecasting is fully considered, in fact, it appears that we may properly look forward to a time when our present system of stream discharge measurements will be supplemented by equally broad continuous study of anticipated flow, or supply probabilities. Stream gaging, valuable as it is, in the main represents past history; forecasts of supply represent information through which water administration and use can be planned.

Measuring Deep Rock Action

RATIONAL DESIGN of dam foundations bids fair to be advanced by the tests begun at Tygart Dam to determine rock deformation under actual load. Following the elaborate studies at Muskingum of soil deformation under earth-dam loads (*ENR*, April 23, 1936, p. 595), the Tygart tests carry experimental study over a wide range of foundation materials whose behavior in mass under dams has for years been largely guesswork. At Tygart the foundation is residual ledge rock, but of a composition that is about as indeterminate in its capacity to carry load as are unconsolidated soils. By and large this is the rock condition that dam-builders are at elaborate pains to improve by a highly developed technique of consolidation by grouting. Grouting is thought of as a remedy for leakage and uplift rather than as a provision for greater load-carrying capacity, but the combined function is always involved. At Tygart the tests being carried out offer the opportunity of knowing for the first time how a grout-consolidated fissured crust of hard rock resting on compressible shale and clay will carry load and transmit it safely to the weaker supporting materials underneath. The engineers at Tygart are to be complimented on their determination to answer a long debated question, and dam-builders will look forward to a report of the results expectantly.

Native Ingenuity

THE SKILL WITH WHICH Chinese engineers are able to turn the Yellow River back into its channel with dependence only on native labor and local material and almost no mechanical equipment cannot but be acclaimed by engineers elsewhere. Its lesson for a highly mechanized country such as ours is that ingenuity in the use of available material is one of the characteristics that all engineers should aim to develop. In this respect the article by O. J. Todd in this issue is notable because the work just completed records a reversion to methods used before the closing of the great break of 1921, when filling from a trestle, much as was done on the Colorado in 1906-7, was employed in a form modified to meet local conditions. As Mr. Todd, with his knowledge of American methods, served as consultant on both jobs it is apparent that he recognized the advantage of resorting to the older method of pinching off the breach in the levee system by a closure of great stone-laden fascines. Two factors appear to have had an important bearing on the decision: first, the saving in timber required for a trestle, and probably some saving in rock (both of which are costly in comparison to local willow reeds and kaoliang stalks), and second, the expertness of the river "police" in handling materials and in following methods with which they are familiar. This latter indeed appears to have been the controlling factor.

Sewage Treatment Progress

THE SCIENCE AND PRACTICE OF SEWAGE treatment has advanced to the point where it offers a number of processes that can be satisfactorily applied to the purpose of economic purification of wastes. Yet it is freely admitted by research workers and other sanitary experts that present knowledge has not been utilized to its full possibilities. The fact is that the mechanism of purification, which in essence is the application

of artificial means to intensify natural forces of oxidation and reduction, is exceedingly complex: It involves biological, biochemical and physico-chemical reactions, some of which occur simultaneously while others follow in a delicately balanced sequence. As research progresses many of these intricate relationships and their control are being interpreted more truly, and the new knowledge is being applied to the improvement of practical operation. Thus, separate sludge digestion reached a high plane of efficiency following the completion of critical studies which analyzed and outlined the effect of seeding, pH and temperature control. At the present time similar fundamental studies are being made on the activated sludge process, and they promise to result in more economical operation. The new "biofiltration" is another typical illustration of the refinement of purification methods—here the trickling filter process has been modied so that it will handle more than eight times the loading previously considered as maximum. On the strength of semi-plant-scale performance the process holds high promise. All told it is clear that the perfection of existing methods of sewage treatment rather than the introducion of revolutionary new processcs is likely to be the most significant trend of future disposal practice.

Silicosis Laws

THE uncertainty of the need, effect and operation of silicosis legislation is strikingly illustrated by the experience of New York state during the last eight months. For some years past legislation of various kinds had been proposed, but it always failed to reach enactment. Labor was demanding some sort of compensation for silicosis and kindred diseases, while industry either ignored the dust hazard or froze into silence through fear of reprisal from old infected workers. Meanwhile suits totaling millions of dollars were filed, mostly against the foundry industry.

Suddenly New York found on its statute books a law, becoming effective Sept. 1, 1935, providing that *all* occupational diseases are compensable. Silicosis and other dust diseases were naturally included. To accompany this law certain other acts had been prepared, to harmonize the claims of labor and industry, to define the occupational diseases to be covered, to limit the amount of compensation, and otherwise to safeguard the interests of all concerned; but these companion bills failed of enactment, and only the bald provision that all occupational diseases are compensable reached the status of a law.

Consternation gripped the industrial, construction and insurance fields, developing into mild hysteria by the time the new act became effective. Some insurance companies cancelled compensation policies wholesale, leaving employers bewildered and unprotected; other companies insisted on the discharge of all employees in whom the slightest suggestion of silicosis or other disease appeared. Contractors were advised on one hand to X-ray all new employees, but not old workmen; on the other hand they were advised to get rid of all employees that showed symptoms of any occupational disease. Transfer to the state insurance fund was the only course open to many employers. Premium rates for coverage under the new law were immediately raised to ridiculous and prohibitive heights, on the theory that a large reserve must be quickly established until experience should dictate the proper rates.

Industry of all kinds sought shelter under the best insurance coverage it could find or afford. Industry as well as insurance companies waited to see what would happen. What happened?—Nothing! In eight months only a handful of claims were filed under the new law, and but few of these were considered valid.

Reason and calm are now replacing the former hysteria. Industry and insurance interests are coming out of the trenches to cooperate with the state labor department and with labor in the formulation of new sane and clarifying legislation. Very properly the labor department is now making a survey of industry to learn, if possible, the extent of the silicosis hazard and the prevalence of the disease itself.

Until more is known about the practical aspects of silicosis proper, fair and adequate legislation concerning the disease is impossible. We must determine, by specific industries, at what stage of the disease a silicotic becomes partly or totally disabled, and thereby is eligible for compensation. We must learn more of the degree of the dust hazard in the various industries. We must develop more adequate control of the hazard, and in this connection provide some means whereby an employer's insurance rates are based upon his endeavor and success in combating the hazard.

Just now, when silicosis laws are being proposed in many states, the experience of New York should be a valuable guide in showing the fallacy of making the legislation all too inclusive, vague and unlimited. Proper legislation can come only after all the facts of the hazard to be controlled are known.

An Earth-Handling Problem

WHAT IS SEEN on a small scale in the Tennessee mill-pond whose rapid silting was recounted last week is proceeding in scores of reservoirs throughout the country on a vastly larger scale. The reality and rapidity of reservoir silting is not subject to doubt, although few definite facts are available and the rate of silt accumulation doubtless varies widely.

Much hopeful talk is indulged in about what can be done to prevent reservoir silting, but at least in the West it is likely that no dependable means of prevention will be found regardless of what may be done for soil conservation. This means that in time it will be necessary to undertake removing the silt, for the abandonment of reservoirs and construction of new ones above or below is in general not feasible—for lack of sites as well as for cost reasons. If it becomes necessary to clear reservoirs of silt, however, new earth-handling problems will have to be solved. Methods will have to be devised to dredge huge volumes of deposit and move them large distances to places of final disposal at costs far below any that have yet been achieved in hydraulic work. In some cases also it may be imperative to handle the work in such a way as to avoid disturbing the sediment sufficiently to make the reservoir effluent turbid to any marked degree.

This is not an easy set of requirements, and the solution is bound to call for much patient study and perhaps also some large-scale experimenting. The time has come when development work ought to be undertaken, and it would be gratifying if some agency that has a group of reservoirs in its care should make a beginning in trying out different methods, so that the requirements of the problem may be clearly defined in practical terms.

CURRENT NEWS

Greenbelt Work Enjoined by Court

Injunction granted against continuing on Resettlement Administration's Bound Brook, N. J., project

GRANTING of an injunction against the Resettlement Administration's Bound Brook, N. J., project this week, by the U. S. Court of Appeals in the District of Columbia, came on the heels of a statement from President Roosevelt there would be no more money spent on that phase of Tugwell's program.

The President asserted he felt the samples dotted here and there throughout the country bespeak the value of the greenbelt community projects, while the court, citing the Schechter decision, declared the spending of relief funds for resettlement was unconstitutional because the act failed to set up any definite standard or guide for such spending.

Even before these happenings had brought the Resettlement Administration to the front once more, other circumstances had combined to focus general attention on the whole problem. Senator Barbour had obtained approval of a resolution calling for information on several distinct points, including the nature and extent of expenditures, nature and extent of the projects as well as the wisdom of attempting further similar plans; effect of the projects on state and local taxation and real estate values; extent to which labor had benefited by the projects, and, lastly, the security of tenants and purchasers on resettlement projects.

Rural rehabilitation, as distinct from suburban community development, bids fair to continue but on a markedly restricted scale. The same is true of the purchase of submarginal land. President Roosevelt shed light on this part of the program when he intimated that the program is not over and that it is necessary to clear up what has been started. He added that RA would not be allowed to expire as a whole, and declared that it serves a most practical purpose.

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Florida Canal and Quoddy Study Considered by Senate

Senator Robinson's resolution, which was introduced on May 13, for the appointment of two three-man engineering boards to examine and report on the Passamaquoddy and Florida Canal projects is under consideration by the Senate Commerce Committee, where it is expected that a number of amendments will be considered. Senator Vandenberg of Michigan, an opponent of the two projects, expects to propose several changes, including the addition of two business men to each board to consider economic aspects; the holding of public hearings, and the submission of the boards' reports to Congress, rather than to the President.

Administration backing for the resolution has not yet appeared, but it is considered probable that Senator Robinson is acting in consonance with Administration policy in pushing the resolution. Opposition to the two projects is very strong, and it is considered unlikely that the resolution will pass without strong pressure from the White House.

Under the resolution further allotments for continuation of the projects would be made if the commissions found them justified. Such allotments would come from relief funds and would not exceed $10,000,000 for the Florida Canal and $9,000,000 for Quoddy.

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Flood Control Federation Organized in Washington

To speed the work of legislation along, several hundred local officials, chamber of commerce representatives and citizens from the flood areas of New England, New York, Pennsylvania, West Virginia and Ohio held a mass meeting in the Senate Office Building on May 18. They were addressed by a number of Congressmen and by leading members from their own ranks. A new organization was formed, the United States Flood Control Federation, for the purpose of coordinating and aiding local flood control movements and as an aid to the establishment of a national flood control policy. State Senator W. B. Rodgers, of Pittsburgh, was designated temporary chairman of the federation.

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Court Denies Injunction Against Housing Project

A temporary restraining order against erection of the $6,000,000 Old Harbor Village, low-cost housing project in South Boston, Mass., was denied on May 12 by the District of Columbia Supreme Court. The court held that there was no immediate danger of damage to the property of the plaintiffs. The court declared that a hearing on the merits of the case would be held before the project could possibly be completed and that until it is finished it cannot attract tenants away from the apartments owned by the plaintiffs.

Bids for construction of the Blue Grass Park and Aspendale housing developments in Lexington, Ky., are to be opened on June 8. Foundation construction on these projects is already well underway. These two projects, which are adjacent, cover a total of 68 acres and will provide living quarters for 286 families in one and two-story group houses and two-story flats. An allotment of $1,500,000 has been set aside for the construction of the two housing projects.

Bids were called on May 13 for construction of Rotary Park, housing project in Oklahoma City, Okla. Two million dollars have been allotted for this project which will accommodate 389 families in units of two to five rooms. Foundation construction on Cherokee Terrace, Enid, Okla., was begun on May 12.

Senate Debates Flood Bills

Consideration of omnibus and Overton flood control measures starts—permanent National Resources Board proposed

DEBATE on the omnibus flood control bill started in the Senate May 19. As finally reported by the Senate Commerce Committee, the measure authorized expenditures, in all sections of the country for flood-control purposes, totalling $384,000,000, but contained a limitation, during the fiscal year ending June 30, 1937, of $50,000,000. The committee also agreed to set aside $5,000,000 for the use of the Department of Agriculture to be used for soil erosion prevention surveys in flood areas.

A pronounced departure from previous practice was a provision creating a permanent National Resources Board of five members to take the place of the present National Resources Committee, appointed by the President last year under the authority of the relief act. The new board would be composed of five members, each to receive $10,000 annually.

Other amendments added by the committee would give the President authority to determine the order in which various flood control projects should be started and to direct the WPA to supply funds for the employment of labor on flood control projects.

The other major flood control measure, the Overton bill carrying $272,000,000 for floodway control of the lower Mississippi River, was given the right of way in the House at a meeting of the Rules Committee on May 18. General debate will be limited to three hours. Consideration of the bill is expected late this week.

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Bill to Tax Cement Apparently Dead

A bill that was introduced in the current legislature of Kentucky to levy a tax on cement manufactured or used in the state has been reported unfavorably by the Committee on Revenue and Taxation. It is considered unlikely that the bill will be taken up again.

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Sinking of Steamer Norman Commemorated by Monument

A monumental pillar, commemorating those who lost their lives when the U. S. Engineer Steamer *Norman* sank in the Mississippi River, May 8, 1925, has been erected at the entrance of the U. S. Engineer Reservation near West Memphis, Ark., and was dedicated in the presence of survivors of the disaster. At the same time a similar pillar was dedicated to the *Beta*, which was, when decommissioned in 1898, the largest known river dredge. In the pillar dedicated to the victims of the *Norman* disaster, a copper box, containing the records of the disaster, photographs, copies of the newspapers and the flags for the steamer, were

placed. A committee was appointed by the Engineers Club of Memphis, Tenn., to design a plaque commemorating the dead.

The steamer *Norman* sank in Cow Island Bend, 16 mi. below Memphis, on May 8, 1925, while a group of engineers who had just attended the first annual convention of engineers of the mid-South was making an inspection trip of the revetment and mattress work along the river. Twenty-two people were either dead or missing after the disaster which took the lives of a number of leading engineers, including Paul Norcross, Atlanta, Ga., and Prof. Walter G. Kirkpatrick, University of Mississippi (*ENR*, May 14, 1925, p. 827). Survivors of the disaster who attended the dedication program are William Richards, H. N. Pharr, Mr. and Mrs. James Wood, W. F. Schulz, L. L. Hidinger and C. W. Okey.

Cooperation Sought for Correct Use of Term "Engineer"

A campaign to enlist public cooperation in stopping the misapplication of the designation "engineer" to non-professional men has been announced by the Executive Committee of the National Society of Professional Engineers at Washington, D. C. "The engineering profession appeals to the public and to the press to stop the confusing use of the term engineer to designate mechanics, locomotive drivers, boiler attendants, and engine operators," said D. B. Steinman, president, "Engineers properly entitled to the designation are professional men with a complete background of academic and professional education and qualifications."

A statement by Willard S. Conlon, executive secretary, states that the use of the word engineer in the sense of a designer, planner, or constructor of military, civil or mechanical works antedates by at least four centuries the invention of the steam-engine. The men who invent, plan and design engines are truly engineers. The men who operate these engines have by popular error been called engineers and, in the interests of correctness and clarity, they should more properly be called engine operators or enginemen.

Lilienthal Reappointed As TVA Director

The three-year term of David E. Lilienthal, junior Tennessee Valley Authority director, which expired May 18, was renewed for a full nine-year period on that date. The nomination of Mr. Lilienthal to succeed himself was sent to the Senate by President Roosevelt, and was confirmed by that body within three hours.

Mr. Lilienthal, one of the original TVA directors, has been credited with a large part of the development of TVA's power policy, one phase of which was unsuccessfully attacked in the courts. The delay in his reappointment has been interpreted as a sign of dissension within the Authority, and rumors were current that he would leave at the expiration of the original three-year term. If there were any such difficulties they have apparently been patched up, as the reappointment of Mr. Lilienthal was made without any outward sign of opposition.

President Assures Continuation of PWA And Resettlement Administration

Court decison holding unconstitutional Emergency Relief Act of 1935 may bring changes in present relief bill, which now gives "blank-check" authority to President—Little chance for amendment seen as leaders plan speedy action

Washington Correspondence

THE RELIEF BILL, providing $1,425,000,000, is still a blank check, despite the efforts of the public works bloc in Congress and assurance by President Roosevelt that it is not his intention to shut off either the Public Works Administration or the Resettlement Administration.

Neither agency has a definite amount that it can count upon as all allotments will be made by Administrator Hopkins, of the Works Progress Administration, or, to be realistic, by the President himself.

In the light of the decision of the U. S. Circuit Court of Appeals of the District of Columbia holding the Emergency Relief Act of 1935 to be an unconstitutional delegation of legislative power, insofar at least as the activities of the Resettlement Administration are concerned, there may be some effort to draft the present bill in more specific terms but not to an extent that actually binds the President's hands.

Relief labor for PWA

Under the method proposed by the President for carrying on the PWA public works program, the 45 per cent grant, heretofore paid in cash, would be computed in terms of relief labor supplied through WPA, an added complication that does not promise much in terms of construction as PWA has had to draw heavily upon non-relief labor to obtain skilled workers. The loan for the balance of project cost would be made, as at present, from the proceeds of the sale through Reconstruction Finance Corporation of securities purchased by PWA in financing previous non-federal projects.

It was to PWA's so-called revolving fund that its supporters turned their attention this week. Senator Hayden's proposal, in which Administrator Ickes apparently concurs, would permit grants as well as loans to be made from this fund. The present law limits the RFC to carrying no more than $250,000,000 of such securities at any one time but amendment would enable PWA to convert into cash an additional $150,000,000 which it now has in its own portfolio by raising the RFC limit until it can dispose of these issues on the market.

Applications total $227,000,000

Grants made out of the liquidation of prior loans constitutes an appropriation as it eliminates from budget reckoning a previously recapturable item, but $400,000,000 made available in this fashion would finance hundreds of pending projects. PWA has an approved list of 1,476 projects for which no allocations have been made because of lack of funds. Their cost would total $349,000,000, but applications total only $227,000,000, of which $144,000,000 would be in grants and $83,000,000 in loans as most municipalities expect to borrow the balance over the grant on the bond market.

Strategists at the Capitol were not pinning their hopes to any one method of obtaining funds for continuation of PWA. Senator Hayden was still seeking an appropriation of $700,000,000 for PWA in addition to the WPA appropriation. The speed with which leaders were planning, however, to push the bill through the Senate, in order to clear the floor for the tax bill, promised no more concessions than the President has indicated.

W. F. Carey Becomes N. Y. Sanitation Commissioner

William F. Carey, a member of the firm of Carey, Baxter & Kennedy, contractors, New York City, has been named to succeed Col. Thomas W. Hammond as Commissioner of Sanitation in New York City. Col. Hammond will become Commissioner of the Department of Water Supply. Mr. Carey is widely known for his railroad construction activities in this country, China and South America. Mr. Carey was for a time vice-president and treasurer of Madison Square Garden Corp. and in 1929 became president of the corporation, holding this position until 1933.

When Col. Hammond assumes his new position as Commissioner of Water Supply, Joseph Goodman will become chief engineer of the Department of Water Supply, filling the vacancy created by the retirement of former chief engineer William W. Brush.

Fails to Pass N. Y. Legislature East River Tunnel Bill

During the last minute rush, prior to adjournment, the Desmond bill which had previously passed the Senate, failed to pass the New York State Assembly. This bill would have amended the New York City tunnel act to change the name of the New York City Bridge Authority, which had been created to build a tunnel under the East River, from Manhattan to Queens, to the New York City Bridge and Tunnel Authority, authorizing it to construct and operate bridges or tunnels across the East River. The bill would also authorize a connecting tunnel through and under the borough of Manhattan connecting the Hudson-Midtown tunnel to the Queens bridge or tunnel. A bill which would provide for construction of a bridge across the Narrows from Brooklyn to Staten Island was allowed to die in committee.

Two appropriations totaling $300,000 for flood control were passed by the legislature and have gone to Gov. Lehman for signing. One of these bills provides $25,000 for the creation of a temporary state commission to assist in consummating a federal program of flood control within the state. The other bill appropriates $275,000 for payment by the state in participation in a federal flood control project.

Gov. Lehman has signed three bills providing for state cooperation in the proposed Worlds Fair of 1939. One bill provides $1,880,000 for the construction of roads.

Relief Work Program Planned For Province of Quebec

Agreement for the early prosecution of a joint relief works program in the province of Quebec, amounting to about $40,000,000, has been reached between representatives of the provincial government of Quebec and the federal government of Canada. Among the larger works being considered is a new highway bridge from the eastern end of the island of Montreal to the mainland. Also planned are sections of the Trans-Canada highway in the province. These sections would be on the north shore route between Montreal and Quebec. A new highway from Montreal to the Laurentian Mountain area, and the long awaited construction of a new entrance road to the city of Montreal, from the western end of the island on which the city stands, a distance of about 20 miles, is also planned. Exact location of this new highway has not as yet been decided. Provincial authorities favor a route along the railroad which follows the waterfront. The city of Montreal favors a boulevard route through the center of the island as the first step in a long term planning project for the city and the island.

Boulder Dam Generation Delayed Until Fall

Power from Boulder Dam will not be available to Los Angeles and other distribution centers until the fall of 1936 because of delays in the installation of generating equipment, according to an announcement by the Bureau of Reclamation. Part of the equipment to be used at the dam was damaged during the recent flood at Pittsburgh, it was stated. It had been planned to start power delivery in July.

New York Construction Shows Upward Trend

Employment, payrolls and man-hours for the construction industry in New York State continued upward in April, according to a statement by industrial commissioner E. F. Andrews. The report, issued on May 19, said that employment advanced 33 per cent, payrolls 36 per cent, and man-hours 39 per cent from March to April. These figures are based on reports of 1,369 firms, many of which were working on federal, state, county or municipal projects during April and employed 18,296 workers. During April up-state construction employment advanced 44 per cent and that of New York City, 27 per cent. The difference in the rate of increase between the two sections is due to the fact that the construction season starts earlier in New York City and the increase there was greatest during March. Average weekly earnings of 33,159 workers amounted to $27.13 in April as compared with $26.60 for 24,869 employees in March.

Building permits issued during April in 103 places throughout the state called for expenditure of $18,278,102 on a total of 8,208 projects as compared with the 7,041 projects of April, 1935, which were estimated to cost $15,916,986. The most important construction group, in terms of estimated cost, is the residential group. Plans for 800 dwellings and apartment buildings to cost $7,921,127 were filed in April, which is, in number, slightly below the 805 filed in March, but the estimated cost is about 20 per cent greater. Although more buildings for industrial and commercial purposes were planned during April than there were during March, there was a sharp decline in their expected cost.

ROTATED CAISSONS FOR ELEVATED HIGHWAY FOUNDATION

Fifty steel cylindrical caissons, from 4 to 5 ft. in diameter and 40 to 58 ft. long, for foundations of the closing link in New York's West Side elevated highway from 45th to 54th Sts., are being sunk to rock by rotating. The steel cylinders, welded into one piece, are spun through the ground and 2 ft. into rock by an electric-powered rotator head carried by a 78-ft. tower mounted on a skid frame. The lower end of the cylinders are fitted with cutting teeth, protected by a welded application of tungsten carbide. As the top of piers is below ground level, a 10-ft. section of pipe is added to the permanent length of cylinder as a follower.

The process of caisson sinking is similar to that used last year on the new federal building in lower Manhattan (*ENR*, July 11, 1935, p. 37); the rotating rig is the same except for improvements in the rotor head. The Atwell-Montee Caisson Corp. is sinking the caissons as subcontractor for James Stewart & Co., general contractor for the highway.

Tours Planned for Delegates To World Power Conference

A series of tours to points of special interest in the eastern and central parts of the country for delegates to the Third World Power Conference to be held in Washington Sept. 7-12 has been announced by the American National Committee of the power conference.

Tour I—Mineral sources and energy; coal, gas, oil, internal combustion engines; Aug. 31-Sept. 6, visiting New York, Detroit, Cleveland and Pittsburgh.

Tour II—Hydraulic sources of energy; dams, hydro-electric plants and hydraulic research; Aug. 27-Sept. 5, visiting New York, Boston, Niagara Falls, Buffalo, Pittsburgh, Zanesville, Knoxville and the Tennessee Valley.

Tour III—Power transmission and distribution with special attention to utilities serving metropolitan areas; steam power plants, electrical equipment, engineering education and research, business management of utilities; Aug. 27-Sept. 6, visiting New York, Schenectady, Niagara Falls, Buffalo, Cleveland, Detroit, Chicago and Pittsburgh.

Tour IV—Railway transport, diesel and steam locomotion, electrification, terminal and road operation, designing and building equipment; Aug. 28-Sept. 5, visiting New York, Schenectady, Chicago and Pittsburgh.

Maurice Holland of the National Research Council is chairman of the committee on planning the study tours. It is expected that following the conference in Washington the study tours will be resumed, ending in New York about Sept. 22.

Senate Bill Would Change Name of Interior Department

Enactment by the Senate of the bill changing the name of the Interior Department to the Department of Conservation merely applies a new label. As such, it may tend in time to establish a legislative and executive policy that will centralize conservation activities in that department.

The bill as originally drafted by Secretary Ickes empowered the President to transfer, subject to veto by Congress, other existing conservation agencies in the federal government but this went down before opposition aroused by the prospective transfer of the Forest Service from the Department of Agriculture.

The original bill also proposed concentration of various public works functions in the department, under a title Department of Conservation and Works, but this also went by the board. Prompt action by the House is expected on the Senate bill.

Further Studies Outlined in Bonneville Power Report

As the beginning of a comprehensive investigation of the possible uses for electric power developed at the Bonneville Dam, the State Planning Board of Oregon has issued a preliminary report. The report, which was prepared by the advisory committee on power, of which J. C. Stevens, consulting engineer of Portland, Ore., is chairman, lists and classifies into various fields of power use more than 300 articles and reports from various sources, and outlines further fields of study and research. The electro-chemical and electro-metallurgical as well as other large power using industries are emphasized as being the more important and valuable uses to which Bonneville power might be put. The studies recommended by the board include a survey of mineral resources, including a long term study of such resources to be carried out by a permanent state department, and an immediate study of the more important known or reported occurrences of economic minerals. Other studies advocated are an economic analysis of the possibility of establishing heavy industries in which power costs are an important factor, possible interconnections with other power systems, use of electric power for pumping in irrigation and drainage projects and the use of electric power for highway lighting.

S.P.E.E. to Have Joint Session with Economics Conference

The sixth annual Economics Conference for Engineers is to be held at the Stevens Institute of Technology camp, near Johnsonburg, N. J., during the week beginning June 28, 1936, concurrently with a summer session sponsored by the Society for the Promotion of Engineering Education on a study of economics in engineering colleges. The sessions of the Economics Conference will be held in the mornings and registrants may participate in two of the following four courses: economic theory, organized by Prof. Horace Taylor, Columbia University, and conducted by Raymond J. Saulnier, Columbia University; production management, conducted by Prof. G. W. Barnwell, Stevens Institute of Technology; industrial psychology, conducted by Prof. W. Van Dyke Bingham, Stevens Institute of Technology; engineering economy, organized by Prof. W. D. Ennis, Stevens Institute of Technology, and conducted by lecturers from four colleges and two industrial firms. The S.P.E.E. lectures and discussions are scheduled for the evenings. Among those who will speak at these lectures are Prof. Westerfield, Yale University; Norman Thomas; Prof. Leo Wolman, Columbia University; Prof. Whitehead, Harvard University; Harold G. Moulton, president of Brookings Institution; William McClellan.

National Power Conference Plans Expansion Program

Plans to broaden the scope of the Midwest Power Engineering Conference, including a change of name to the National Power Conference, have been consummated. Under the new plans more than 60 engineering societies have been invited to become affiliated members of the Conference. The members of these societies number well over 50,000 and form a group interested in the generation, distribution and use of power. Headquarters of the National Power Conference have been set up in Chicago, Ill., under the direction of G. E. Pfisterer, executive secretary.

Educators Favor Uniformity In Engineering Degrees

A large majority of the engineering educators of the country are in favor of adopting uniform degrees in the engineering field, according to an announcement made by the Engineers Council for Professional Development as the result of a questionnaire submitted to the members of the Society for the Promotion of Engineering Education.

Taking degrees in civil engineering as an example, the committee on degrees in engineering of the S.P.E.E. submitted the following:

Degree	*Type*
Bachelor's	Bachelor of Civil Engineering (B.C.E.)
Master's	Master of Civil Engineering (M.C.E.)
Doctor's	Doctor of Civil Engineering (D.C.E.)
Honorary	Master of Engineering (M. Eng.)
Honorary	Doctor of Engineering (D. Eng.)
Professional	Civil Engineer (abandon as earned or honorary)

The favorable votes on all but the last item exceeded 80 per cent of those cast. On the last question, abandonment of the title "Civil Engineer" 61 per cent voted in its favor. The committee on professional recognition of the E.C.P.D. approved the proposed set-up except for abandonment of the professional degree of civil engineer.

Power Commission Postpones Cheat River Hearing

In view of the fact that the President on May 5 approved an act authorizing a preliminary flood-control survey of the Cheat River in West Virginia, the Federal Power Commission has postponed indefinitely a hearing previously scheduled for June 15 on the license application of the West Virginia Power and Transmission Co. for permission to construct an extensive hydroelectric development.

Institute of Government To Meet in California

Public officials from all parts of the nation are to participate in the eighth annual Institute of Government, sponsored by the School of Government, University of Southern California, June 15 to 19.

Planning commissioners from many cities will take part in the planning section of the Institute, one of seventeen phases of government operation that will be considered during the five-day session, according to W. Ballentine Henley, acting-dean of the School of Government.

Subjects to be considered in lectures by authorities and by the participants in the Institute at round tables and informal conferences, include: The legality of open-space requirements in zoning ordinances; the legal control in present day planning; County and non-urban zoning.

British Columbia Has New Wage and Hour Law

A new fair wage statute for all government contracts, replacing the Fair Wage and Eight-hour-day Act in 1930, became effective on May 1 in British Columbia. It was assented to on June 28, 1935, and under it all contractors on government work must pay rates of wages set by the federal department.

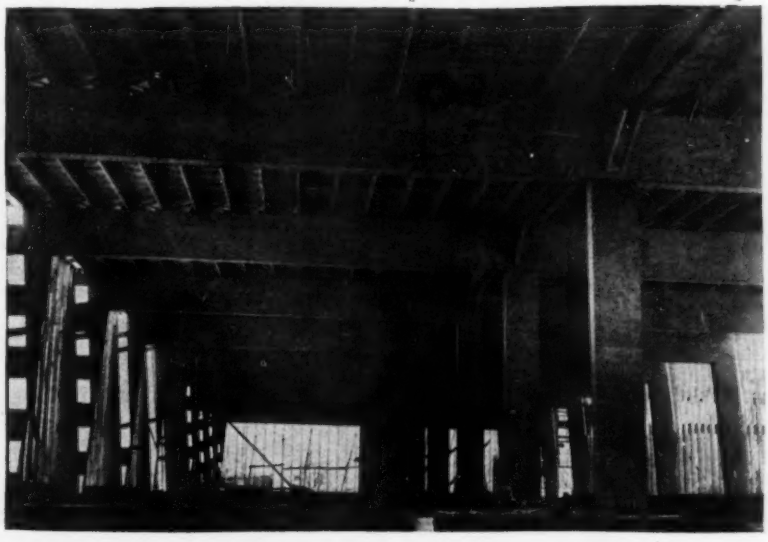
Under the new act, fair wages means such wages as are generally accepted as current for competent workmen in the district in which the work is being performed. Working hours of employees shall not exceed eight hours per day or 44 hours a week, except in special cases as the government may provide, and in cases of emergency. Enforcement of this statute rests in the hands of the department of labor, whose representatives in the different parts of Canada may provide regulation for the methods of determining what are fair wages, rates of wages for overtime and classification of employment.

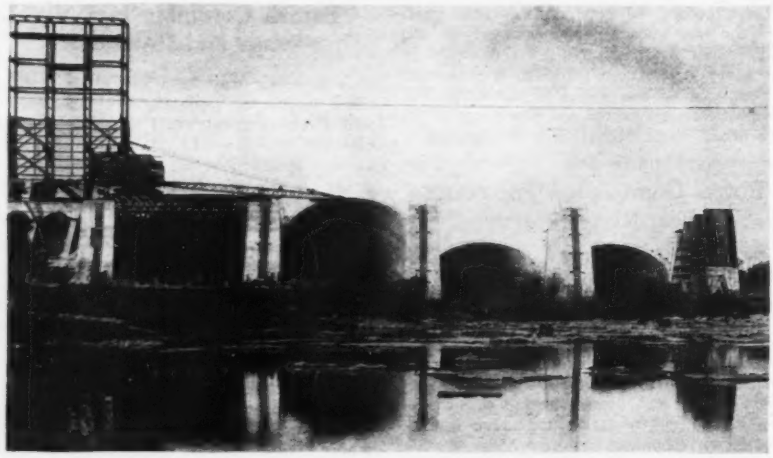
Illinois Plans Large Highway Program

A highway construction program costing $37,670,000, an increase of more than $15,000,000 over expenditures in 1935 has been announced by the Illinois Department of Public Works. The new program will include 138 miles of concrete pavement, 51 miles of bituminous surfaced gravel or stone, 137 miles of gravel or crushed stone surfacing, 522 miles of grading, 39 large bridges, 86 railroad grade separations, 3 highway grade separations and 81 miles of highway landscaping. Funds for the program will be secured from state and federal sources. Contracts amounting to over $13,000,000 have already been awarded.

TIMBER RIGID FRAMES UTILIZE STRESSED COVERING PRINCIPLE

A part of the framing of the Hall of Progress building at Cleveland's Great Lakes Exposition is built on the stressed covering principle adapted from airplane design and first applied to construction use by the Forest Products Laboratory (*ENR*, April 11, 1935, p. 525). In the Cleveland building the principle is used in the design of a series of two-span rigid frame bents that support a flat roof. The spans are 30 ft. center to center of the legs and the bents are spaced 20 ft. apart. The makeup of the members is uniform, consisting of two 2x10-in. timbers as flanges joined by web trussing of 2x6's, and the entire framework sheathed in ⅜-in. plywood. The plywood, attached by a large number of nails, serves as a stressed skin carrying an appreciable part of the loads. The building was designed by C. Merrill Barber, consulting engineer, Cleveland. Hays & Simpson are the architects.





HAMILTON DAM TO BE COMPLETED BY RECLAMATION BUREAU

Hamilton Dam, on the Colorado River of Texas, about 10 mi. west of Burnet, Tex., begun in 1931 as a private undertaking, is to be completed by the Lower Colorado River Authority. Construction is to be carried on by the Bureau of Reclamation.

The dam will have a length of 8,377 ft. The main portion, extending across the river channel, is of multiple-arch, non-overflow type, 28 arches of 70-ft. span and reaching a maximum height of 154 ft. Flanking this on both sides of the river are long low sections of 35-ft. multiple-arch spillway and gravity-section bulkheads. A power house with space for three 12,500 kw. generators is included.

A description of this dam was published in *Engineering News-Record*, Jan. 12, 1933, p. 59. Work on the project was suspended in April, 1932, after a considerable part of the work involved in the dam had been completed.

Brief News

BIDS FOR CONSTRUCTING the superstructure of the proposed bridge over the Neches River at a point between Port Arthur and Orange, Tex., estimated to cost $1,350,000, will be received by the State Highway Department June 10. Construction of the substructure of the bridge is already underway (*ENR*, March 19, 1936, p. 439). The entire project will cost more than $2,000,000. The purpose of the bridge is to replace a ferry.

CHARGES against highway commissioners who were dismissed last fall by Governor Johnston of South Carolina are being dropped according to a message which the Governor sent to the state Senate on May 8. Shortly after this message was received the Senate passed and sent to the House a combination measure providing for reorganization of the highway department, issue of road construction bonds and reduction of license fees. The measure was approved by the Senate in the form of an amendment to a House bill to reduce license costs and came after the House had sustained Gov. Johnston's vetoes of separate reorganization and bond issue bills.

THE U. S. SUPREME COURT accepted, on May 18, the answer and cross-bill of the state of Colorado in Nebraska's suit against Wyoming over the waters of the North Platte River. Nebraska and Wyoming were granted 60 days to file answer.

CONSTRUCTION of a $2,500,000 bridge over the St. Clair River connecting Port Huron, Mich., with Sarnia, Ont., will be started during June, according to an announcement by the Michigan state highway department, following the decision of the state administrative board to finance the approach on the American side at a cost of $629,000. The Ontario highway commission has agreed to build the Sarnia approach and the bridge itself will be built by the Michigan State Bridge Commission through a bond issue to be secured by tolls of 50c. per car. The bridge will be a cantilever type with an 850-ft. span.

SOCIETY CALENDAR

MIDWEST WELDING CONFERENCE, Chicago, Ill., June 4-6.

AMERICAN WATER WORKS ASSOCIATION, annual meeting, Los Angeles, Calif., June 8-12.

INSTITUTE OF GOVERNMENT, eighth annual conference, Los Angeles, Calif., June 15-19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, semi-annual meeting, Dallas, Tex., June 15-20.

INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING, Cambridge, Mass., June 22-26, 1936.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, annual meeting, Madison, Wis., June 23-26.

HIGHWAY SAFETY CONFERENCE, Ames, Iowa, June 29-July 2.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Atlantic City, N. J., June 29 to July 3.

CANADIAN GOOD ROADS ASSOCIATION, annual meeting, Charlottetown, P.E.I., September 1-3.

THIRD WORLD POWER CONFERENCE, Washington, D. C., September 7-12.

PUBLIC WORKS CONGRESS, joint meeting, AMERICAN SOCIETY OF MUNICIPAL ENGINEERS AND INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Toronto, Ont., September 28-30.

NEW JERSEY SECTION, AMERICAN WATER WORKS ASSOCIATION, inspection of Wanaque Reservoir; guest speaker, Prof. L. V. Carpenter, May 27.

ILLINOIS ASSOCIATION OF SANITARY DISTRICTS, annual meeting, Urbana, Ill., June 11-12.

NEW YORK STATE SEWAGE WORKS ASSOCIATION, spring meeting, Long Beach, Long Island, June 11-13.

EXAMINATIONS for registration as Engineers, Land Surveyors and Architects will be held as follows:

MICHIGAN—Examinations for Engineers and Land Surveyors at University of Michigan, Michigan State College, Michigan College of Mines, and at Ironwood; for Architects, at University of Michigan, June 18-20.

Personals

JAMES W. CAREY has become state PWA engineer-inspector for Washington. Mr. Carey has been chief engineer for the state of Washington, Department of Public Service, for the past three years.

WILLIAM W. CARLTON, chief structural engineer of the building department, Cincinnati, Ohio, resigned, effective June 1, to become associated with the H. C. Nutting Testing Laboratories, Cincinnati, as a consulting engineer. He was appointed structural engineer for the city of Cincinnati in 1927.

EDWARD P. LUPFER, president of the Edward P. Lupfer Corp., consulting engineers, Buffalo, N. Y., has been appointed directing engineer of the Buffalo Sewer Authority.

A. E. PARE, civil engineer, Quebec, has been appointed hydraulic engineer of the Quebec Provincial Department of Lands and Forests.

C. H. LEE, San Francisco, Calif., has been appointed chief water supply and sanitary engineer for the San Francisco Bay Exposition which is to open in 1939. A. J. EVERS, also of San Francisco, has been appointed as chief specification writer, while W. E. LELAND and E. F. ENGLISH, both of San Francisco, have been appointed chief mechanical engineer and chief electrical engineer, respectively.

ALFRED M. LUND of Little Rock has been appointed as chief engineer inspector for the Little Rock, Ark., $3,080,000 water supply system, and C. S. YOUNG will serve as chief engineer inspector for the city's new sewer system.

CAPT. PAUL L. REED, Corps of Civil Engineers, U. S. Navy, has been detached from duty as public works officer, Naval Operating Base, Norfolk, Va., and is now awaiting orders pending his retirement on Sept. 1. LIEUT.-COMMANDER ANDREW G. BISSET, CEC, has been transferred from duty at the Navy Yard, Pearl Harbor, Hawaii, to duty at the Naval Academy, Annapolis, Md. LIEUT.-COMMANDER THERON A. HARTUNG, CEC, has been transferred from duty at the Naval Academy to duty at the Navy Yard, Puget Sound, Wash. LIEUT. RICHARD P. CARLSON, CEC, has been transferred from the Naval Station, New Orleans, La., to the Navy Yard, Charleston, S. C. LIEUT. HAROLD M. SYLVESTER, CEC, has been made assistant public works officer, Naval Air Station, Anacostia, D. C.

G. T. MACNAB, senior highway engineer of the Bureau of Public Roads, retired from the service on April 1. Mr. MacNab had been in charge of the Raleigh office of the Bureau of Public Roads since 1920.

ABEL WOLMAN, engineer and chairman of the Maryland State Planning Commission, has been appointed as one of the delegates to represent the state at the Third World Power Conference in Washington from Sept. 7 to 12.

A. F. JOHNSON, engineer for the Bureau of Reclamation, left Washington to go to the Virgin Islands where he will make a study of water resources to determine what unused water is available for municipal and irrigation purposes. Mr. Johnson formerly had been working on the Central Valley project in California.

Obituary

J. OLIVER DERBY, for many years village engineer of Pleasantville, N. Y., died at his home there on May 16. Mr. Derby, who was a graduate of Cooper Union, designed the sewer and water systems of Pleasantville. At one time he had been an assistant engineer for the New York Central R.R.

FRANK ORMAND WHITNEY, for nearly 50 years connected with the engineering department of the city of Boston, Mass., died at his home in that place on May 13. He was born in Fitchburg, Mass., 84 years ago and was graduated from the Worcester Polytechnic Institute in 1871. He entered the city's employ and for many years had charge of all street construction. He retired in 1924, and was a life member of the Boston Society of Civil Engineers and American Society of Civil Engineers.

B. G. COVINGTON, former chief engineer of the St. Francis Levee Board of Arkansas, died at his home in Memphis, Tenn., on May 14. In 1901 Mr. Covington was appointed as an inspector for the levee board and three years later was made assistant chief engineer. He succeeded to the position of chief engineer in 1907.

GEORGE C. D. LENTH, secretary of the Clay Products Association for fifteen years and prior to that for ten years chief engineer of sewers of the Chicago Board of Local Improvements, died May 11 in that city. Born in 1882 in Garrett, Ind., he was graduated in 1903 in civil engineering from the Massachusetts Institute of Technology. His early experience was with railroads, telephone company, Cook County and city of Chicago in the bridge and sewer departments. He was a member of the Chicago Advisory Subway Engineering Commission in 1930 and 1931.

WILLIAM A. MILLER, 70, commissioner of city parks, St. Louis, Mo., died May 13. He was appointed Park Commissioner in April, 1933.

RAJENDRA N. MOOKERJEE, a civil engineer and senior member of the firm of Martin & Co., engineers, contractors and merchants, and also of Burn & Co., Calcutta, India, died there on May 15 at the age of 82. Sir Rajendra, who had been president of the Institute of Engineers of India in 1921, was a member of the board of governors of the Bengal Engineering College.

CONSTRUCTION STATISTICS FOR THE WEEK

ENGINEERING construction awards are up to $36,173,000 this week of which $8,715,000 is for private work and $27,458,000 for public. Of the public, federal awards drop to the low volume of $976,000 and state and municipal rise to $26,482,000. Corresponding values a year ago are: total, $34,299,000; private, $5,187,000; public, $29,112,000 of which federal is $18,335,000 and state and municipal, $10,777,000.

Bridges establish their record high volume for this year, totaling $6,089,000 for the week. Highway awards rise to $10,996,000. Industrial building awards are up to $3,849,000 and public buildings to $5,132,000. Totals for other classes of work are: commercial buildings, $2,787,000; sewerage, $1,033,000; waterworks, $922,000; earthwork, drainage, $496,000; unclassified, $4,869,000.

The larger projects include: market for Boston Regional Produce Market, Cambridge, Mass., $1,000,000; pulp plant, St. Regis Kraft Co., Tacoma, Wash., $1,000,000; school, Union Springs, N. Y., $518,000; high school, Norwalk, Conn., $900,000; highways, by New York, $1,440,000; by Wisconsin, $1,269,000; by Connecticut, $1,233,000; by Illinois, $1,924,000; by Texas, $1,061,000; bridges, by New York, $900,000; by Pennsylvania, $797,000; by Illinois, $1,413,000; boardwalk, Long Beach, N. Y., $683,000; airport for city of Dayton, Vandalia, Ohio, $700,000; 70-mi. 10-in. pipe line and terminal facilities from Kettleman Hills to Estero Bay, Valley Pipe Line Co., Los Angeles, Calif., will be built at a cost of $1,500,000.

State and municipal bond sales for construction purposes total $7,262,000 for the week and corporate financing for new construction, $12,624,000.

CONTRACTS
(Thousands of Dollars)

	Weekly Average May 1935	Prev. 4 Weeks	Week May 21, 1936
Federal Government	$4,057	$2,396	$976
State and Municipal	12,172	22,014	26,482
Total public	$16,229	$24,410	$27,458
Total private	8,336	9,721	8,715
Week's total	$24,565	$34,131	$36,173
Cumulative to date:			
1935...$516,063,000	1936...$901,992,000		

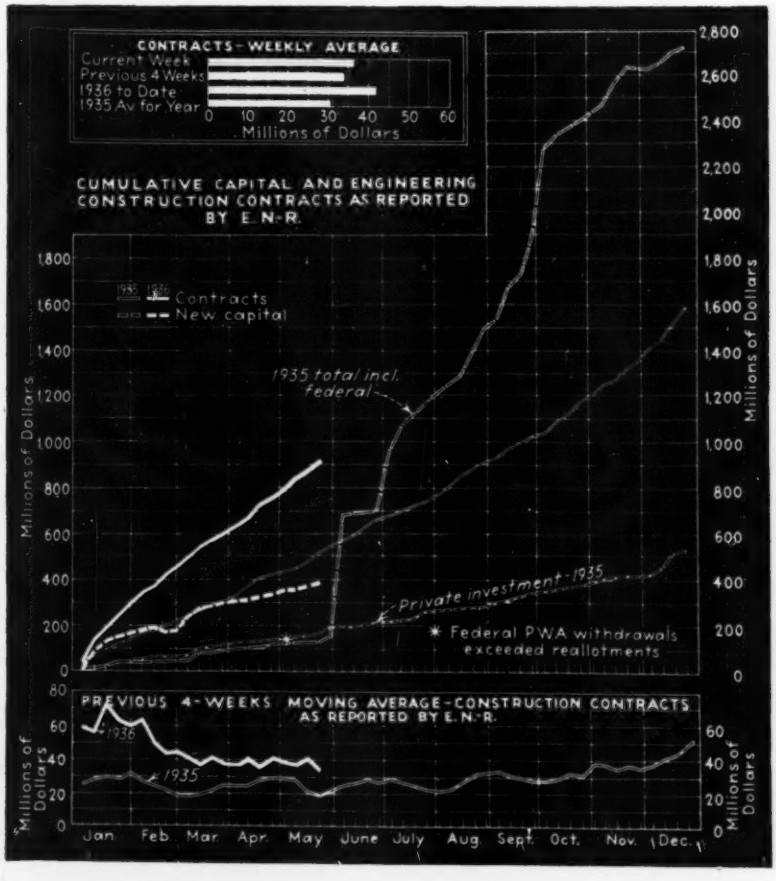
NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

1936	Week May 21	Cumulative
State and municipal	$7,262	$206,492
PWA non-federal	....	40,547
RFC loans	....	37,008
Corporate issues	12,624	102,696
PWA loans, Private	....	1,270
Total Non-Federal	$19,886	$388,013
Federal	....	4,955
Total new capital	$19,886	$392,968
Cumulative to date:		
1935...$132,032,000	1936...$392,968,000	

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for federal construction, deficiency act funds. An arbitrary percentage (25%) of the WPA allotments and local contributions to WPA work is included to allow for the capital additions through the Works Progress Administration division of the new program.

INDEX NUMBER

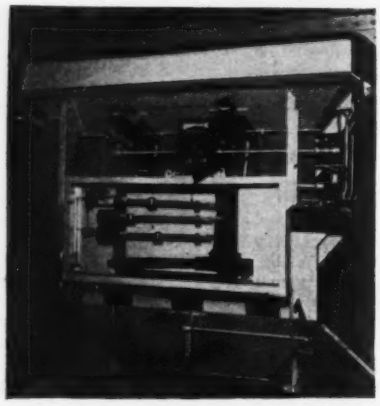
ENR Cost	1913 = 100	1926 = 100	ENR Volume	1913 = 100	1926 = 100
May, 1936	203.40	97.77	Apr., 1936	166	73
Apr., 1936	202.20	96.71	Mar., 1936	160	70
May, 1935	194.06	93.28	Apr., 1935	130	57
1935 (Av.)	195.22	93.84	1935 (Av.)	135	58
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50
1933 (Av.)	170.18	81.80	1933 (Av.)	102	47


CONTRACTS - WEEKLY AVERAGE
Current Week
Previous 4 Weeks
1936 to Date
1935 Av for Year
0 10 20 30 40 50 60
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY E. N-R.
1935 1936
Contracts
New capital
1935 total incl. federal
Private investment-1935
* Federal PWA withdrawals exceeded reallotments
Millions of Dollars
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY E. N-R.
1936
1935
Jan Feb Mar Apr May June July Aug Sept Oct. Nov. Dec.

Construction Equipment and Materials

Aggregates Weighing Batcher

In the 1-cu.yd. semi-automatic weighing batcher for three aggregates, which is made by the Blaw-Knox Co., Pittsburgh, Pa., the filling gates are manually opened, but close automatically when the correct weight is



reached. An intermediate position of the gate closing permits dribble of the aggregates prior to the final cut-off. The batcher is equipped with a three beam scale and springless indicator with mercury contacts for automatic closing of the filling gate.

Black-Top Scarifier

A scarifier for reworking oil treated gravel and macadam roads has been announced by the Austin-Western Road Machinery Co., Aurora, Ill. The machine consists of a 31-tooth unit, mounted in place of the blade and standard scarifier attachment.

The depth of cut is controlled hydraulically from the operator's platform and either end of the scarifier can be raised or lowered independently. This permits the operator to operate with all teeth horizontal to the surface or to set the teeth so that the front rows barely scratch the surface, while the rear teeth carry well into the material. An anti-chatter device holds the circle to the draft beams and prevents all play in operation. An adjustable blade set at the rear of the motor grader makes it possible to respread the material and windrow the excess in either direction. Use of this scarifying unit demands greater weight and power of the motor grader, and for this reason the manufacturers offer the unit for use with the "77" Senior Dual Drive Grader only.

Midwest Welding Conference

A conference covering recent developments in the welding industry is to be held in Chicago, Ill., June 4-6, and is being run by the Hollup Corp., American Brass Co., American Manganese Steel Co., American Steel & Wire Co., Compressed Industrial Gases, Inc., *The Welding Engineer*, Westinghouse Electric & Manufacturing Co. It is expected that other manufacturers will also cooperate in the enterprise.

In addition to demonstrations and exhibits of welding, there has been arranged a program of lectures and papers to be presented by men prominent in the welding field. The following men have been invited to present papers to the conference: Thomas Jones, Illinois Steel; R. R. Royal, Illinois Central R.R.; L. C. Monroe, *The Welding Engineer;* A. M. Candy, The Hollup Corp.; W. W. Reddie and J. H. Blankenbuehler, Westinghouse Elec. & Mfg. Co.; Ernest Wanamaker, Rock Island R.R.; E. A. Randall, Compressed Industrial Gases, Inc.; Louis J. Larson, A. O. Smith Corp.; E. L. Quinn, American Manganese Steel Co.; R. C. Fisher, American Steel & Wire Co.

Convertible Excavator

An excavator that is quickly convertible into a dragline, crane or trench hoe is now being made by the Koehring Co., Milwaukee, Wis. High strength steels and welded construction have been used to give added strength with decreased weight. The Model 251 is a ⅝-yd. shovel fully convertible with a ¾-yd. rating as a crane or dragline. Two traction speeds give greater adaptiveness

to rough or smooth ground conditions, while two selective swing speeds allow better synchronization with the arc of swing and height of lift, thus increasing the output of the machine.

New Equipment in Brief

Stadia Reduction. A stadia reduction chart for reducing stadia notes is now being marketed by Engineering Devices Co., New York, N. Y. The reduction chart, which is about 25 in. in diameter, simplifies the process of reducing stadia notes. Two arms, on which distances are scaled, are furnished with each reduction chart. These arms are pinned to the center of the chart and the Stadiascope is used by setting the proper arm on the given vertical angle shown on the outer circumference and the vertical difference and horizontal correction may then be read from the Stadiascope opposite the observed stadia distance.

Paint Spray Gun. A pistol-type spray-gun, known as Type MM, is now being made by the Paint Spray Equipment Division of the Alexander Milburn Co., Baltimore, Md. The gun has a single-unit detachable spray head of drop-forged bronze which may be quickly taken off for easy cleaning of the gun. The gun handle and body are of one piece die-cast aluminum alloy. One adjusting nut operates a needle valve to regulate air flow to the atomizer head, controlling spray volume and another nut adjusts fluid flow, assuring perfect feeding.

Plastic Rubber Coatings. A plastic rubber coating, which shows only 8½ per cent shrinkage when cured, has been announced by the Self-Vulcanizing Rubber Co., Inc., Chicago, Ill. This product, which is known as Selfvulc Plastic, is held to be especially economical for rebuilding surfaces of conveyor belts which have been worn down by abrasive materials.

New Publications

INTEGRAL-FURNACE BOILER, Babcock & Wilcox Co., New York City. 8½x11, 23 pages.

ENGINEERS MANUAL OF VITRIFIED CLAY SEWER PIPE, Robinson Clay Product Co., Akron, Ohio. 8½x11, 32 pages.

STANDARD HANDBOOK OF REFRACTORIES, Standard Fuel Engineering Co., Detroit, Mich. 6x9, 52 pages.

THE HANCOCK FORGED STEEL VALVE, Consolidated Ashcroft Hancock Co., Bridgeport, Conn. 8½x11, 18 pages.

INDUSTRIAL AND TRANSMITTING CAPACITATORS, Cornell-Dubilier Corp., New York, N. Y. 8½x11, 22 pages.

HYPO-CHLORINATORS, Proportioneers, Inc., Providence, R. I. 8½x11, 5 pages.

ANTI-SLIP PRODUCTS, American Abrasive Metals Co., Irvington, N. J. 8½x11, 4 pages.

ROLLING RING CRUSHERS AND PULVERIZERS, American Pulverizer Co., St. Louis, Mo. 8½x11, 7 pages.

COMBUSTION RECORDERS, The Hays Corporation, Michigan City, Ind. 8½x11, 13 pages.

UNITAIR COMPRESSORS, Sullivan Machinery Co., Chicago, Ill. 8½x11, 8 pages.

AUTO PATROLS, Caterpillar Tractor Co., Peoria, Ill. 8½x11, 37 pages.

MODERN STEAM ENGINES, Troy Engine & Machine Co., Troy, Pa. 8½x11, 48 pages.

CONVERTIBLE POWER SHOVELS, DRAGLINES AND CRANES, Bay City Shovels, Inc., Bay City, Mich. 8½x11, 32 pages. Catalog G.

REX MOTO-MIXERS AND AGITATORS, Chain Belt Co., Milwaukee, Wis. 8½x11, 44 pages.

Business Notes

CUTLER-HAMMER, INC., Milwaukee, Wis., has appointed L. P. Niessen as advertising manager.

THE WAUKESHA MOTOR CO., Waukesha, Wis., announces the election of the following officers: president, James E. DeLong; James B. Fisher, vice-president.

THE HENDRICK MANUFACTURING CO., New York City, has been appointed as distributor and representative for the Mitco Products by the Mitchell-Tappen Co.

THE NEW DEPARTURE MANUFACTURING CO., Bristol, Conn., has moved its Chicago office to 230 North Michigan Ave.

MASTER WATERPROOFERS, INC., and MASTER WATERPROOFING & ROOFING CORP., New York City, have moved their offices to 285 Madison Ave.

M. K. FRANK, manufacturer of mine cars and rails, Pittsburgh, Pa., announces the opening of new offices at 450 Fourth Ave., Pittsburgh.

PENNSYLVANIA PUMP & COMPRESSOR CO., Easton, Pa., has appointed the following agents: Lieb-Jackson, Inc., Columbus, Ohio; F. B. Schwartz, Minneapolis, Minn.

OWENS-ILLINOIS GLASS CO., Toledo, Ohio, announces that construction work has started on a new producing unit at its Insulux Glass Block plant in Muncie, Ind. The new addition to the plant is being constructed of glass blocks, brick and structural steel. Among other glass block building projects now under way are: warehouse, Reynolds Tobacco Co., Winston-Salem, N.C.; grain mill, Nebraska Consolidated Mills, Grand Island, Neb.; dairy plant, Pet Dairy Products Co., Johnson City, Tenn.; bottling plant, Coca Cola Co., Muncie, Ind., and the Ruhl Bakery, Harrisburg, Pa.

CRANE CO., Chicago, Ill., announces the appointment of George L. Erwin, Jr., as assistant to P. R. Mork, vice-president in charge of sales.

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

†Ga., **Fort Benning**—See Public Buildings."

Kan., **Eudora**—City voted bonds for waterworks system, incl. tower and tank. $55,000. Awaiting P.W.A. approval. Shockley Eng. Co., 800 Graphic Arts Bldg., Kansas City, Mo., engrs. Noted Apr. 22, C. D.—Apr. 30, E. N.-R.

Kan., **Summerfield**—See "Sewerage and Waste Disposal."

Massachusetts — Metropolitan Dist. Comn., Commonwealth of Massachusetts, R. N. Molt, secy. Water Supply Div., 20 Somerset St., Boston, plans 2 story, basement, rein.-con., stone head house and service buildings in Greenwich, in connection with Quabbin Reservoir, Swift River water supply now under construction. F. E. Winsor, ch. engr. Water Div., 20 Somerset St., Boston. Noted Apr. 27, C. D.—Apr. 30, E. N.-R.

N. J., Sayreville—T. Thompson, mayor and Council, rejected bids May 6, 5,000 ft. 6 in. transite pipe for line from Ernston Rd. to Rose's Corner. $3,500. Will readvertise. Noted Apr. 22, C. D.—Apr. 23, E. N.-R.

Pa., **Daisytown**—Borough Council received no bids Apr. 30, pumping station, pipe lines, 500,000 gal. rein.-con. reservoir. $88,500. A. P. Thomas, Park Bldg., Johnstown, engr. Noted Apr. 20, C. D.—Apr. 23, E. N.-R.

Pa., **Morrisville**—T. B. Stockham, mayor, and Borough Council abandoned plans for waterworks improvements. $39,000. Noted Mar. 31, C. D.—Apr. 9, E. N.-R.

S. C., **Tucapau**—Startex Mills, W. S. Montgomery, pres., proposed bill introduced in Legislature authorizing company to issue bonds for estimate and maintenance of water and sewer mains for Tucapau. Cost unknown. Tucapau is unincorporated textile manufacturing community.

S. D., **Rapid City**—City, C. Sneckenberger, mgr., voted $90,000 bond issue, water system improvements, drilling new well, constructing pipe line, furnishing, installing valves and fittings, building pump house. $100,000. H. W. Zolpher, city engr.

Tex., **Atlanta**—City, E. C. McKiney, secy., plans waterworks system, incl. 4 mi. distributing lines, pumping unit, fire plugs, etc.; also installing sanitary sewers, collecting lines, probably Imhoff, and sludge systems. $100,000. F. J. Von Zuben, c/o owner, Atlanta, and Electric Bldg., Fort Worth, engr. P.W.A. grant only.

Tex., **Tyler**—City, c/o A. H. Balch, mgr., soon takes bids drilling 500,000 gal. well, pump station improvements and c.i. piping. $15,000. P.W.A. project. Hawley, Freese & Nichols, Capps Bldg., Fort Worth, engrs.

BIDS ASKED

★ **Ark., Little Rock** — June 15, by City, for constructing pipe line connecting city with proposed Alum Fork Water reservoir. $1,800,000. P.W.A. Project. Bids will be asked in 2 sections but will be awarded as a unit if the unit bid offers a lower price than total of individual bids. Concrete will have a preferential standing. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Jan. 27, C. D.—Jan. 30, E. N.-R.

Colo., Pueblo—See "Contracts Awarded."

Mo., St. Louis—See "Contracts Awarded."

N. Y., Brooklyn—May 28, by J. McKenzie, comr. Docks, Pier A, Battery Pl., New York, installing intake pipe lines under and in shore bulkhead of wall between West 23rd St. and West 24th St., Gravesend Bay, Brooklyn Boro, in connection with Dpt. Water Supply, Gas & Electricity, improvement. P.W.A. project.

N. Y., Buffalo—May 28, by City, City Hall, retubing Babcock and Wilcox horizontal water tube boiler at F. G. Ward Pumping Station Div. Water.

N. C., Richlands—May 26, by J. E. Rand, mayor, and Bd. Town Comrs., Sect. 4, 2 deep well turbine type pumping units, incl. motor, pump, electric switches, wiring. W. F. Freeman, High Point, consult. engr.

Tex., **Ft. Davis**—See "Public Buildings."

Wis., Random Lake — June 4, by Village, constructing waterworks and sewerage system. A. E. McMahon Eng. Co., Menasha, engrs.

Sask., Swift Current—June 1, by F. J. Ashford, city clk., general contract covering concrete reservoirs and building; mechanical gravity filter equipment, pumps and motors, chemical feeders, etc.; c.i. piping, valves and specials; electrical equipment. Underwood & McLellan, 102 Grain Bldg., Saskatoon, engrs. Noted Mar. 20, C. D.—Mar. 26, E. N.-R.

LOW BIDDERS

★ **Colo., Denver**—Bd. Water Comrs., City and County Bldg., May 12, constructing Ralston Creek Dam, outlet works and spillway, from United Constr. Co., Winona, Minn., $1,041,252. Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

CONTRACTS AWARDED

Ariz., Prescott — City, constructing 175 ft dam on Upper Hassagampa River in Yavapai Co., to hold runoff water in check until it can be transferred by gravity pipe line into Banning Creek Storage Creek, to Pearson & Dickerson, Prescott. Est. $123,000. **P.W.A.**

Colo., Pueblo—Trustees Pueblo Water Works, D. P. Porter, supt., 319 West 4th St., 12,000 lb. reinforcing steel to Colorado Builder's Supply Co., 1534 Blake St., Denver, $3.96 and $4.26 per 100 lbs., carload of cement to Newton Lumber Co., Pueblo, and King Lumber Co., at $2.94 per bbl. Will use day labor in building concrete flume. Noted Apr. 29, C. D.

Conn., Norwalk—City, buildings and structures, water filtration plant, 5 m.g.d.c., head house, water basin filter, chemical and pumping equipment, Contr. A structures, to T. F. Foley & Co., 81 Day St., South Norwalk, $133,679; Contr. B, filter, chemical and pumping equipment, to Roberts Filter Mfg. Co., Darby, $40,830. Total est. $200,000. **P.W.A.** Bids Apr. 20. Noted Apr. 7, C. D.

Mass., Harwich—Town, Bd. Selectmen, Town Hall, pumping station and furnishing, laying 16 mi. c.i. pipe watermains together with hydrants, valves, house services, elevated steel tank, pumping station, equipment, etc., to C. Reppucci & Co., 10 Garden Court St., Boston, $241,958. Bids Apr. 23, awarded May 7. **P.W.A.** Noted Apr. 29, C. D.—Apr. 16, E. N.-R.

Mass., Woburn—City, E. W. Kenney, supt. Bd. P. Wks., City Hall, constructing ground water supply system, to C. Reppucci & Co., 10 Garden Court St., Boston. $116,255. **P.W.A.** Bids Dec. 18, awarded May 5. Noted Jan. 2. C. D.

Mo., St. Louis—St. Louis Water Dpt., laying watermains and placing fire plugs, valves, etc., in Bancroft Ave., own forces.

Mo., Stockton—City, waterworks distribution system, to Rex Constr. Co., 424½ Main St., St. Joseph, $26,439. **P.W.A.** Bids Mar. 26. Noted Feb. 26, C. D.

N. J., Trenton—Institutions & Agencies, Trenton, 700 gal. centrifugal pump, water tank, piping at State Hospital, to P. Slack & Co., 211 Perry St., $4,593. Bids May 13. Noted Apr. 27, C. D.—Apr. 30, E. N.-R.

N. Y., Albany—City, City Hall, additional reinforcing material for Basin CV, city reservoir, at Loudenville, to Albany Steel & Iron Supply Co., Troy Rd., $8,314. Whitman, Requart & Smith, engrs.

†**N. Y., Fire Island**—Yards & Docks, Navy Dpt., Wash., D. C., repairing water supply system at Naval Direction Finder Station, Spec. 8178, to Washbourne Reconditioning Co., 274 Madison Ave., New York, $4,563. (100 days.)

North Carolina—State Hy. and P. Wks. Comn., Raleigh, drilling well at Rowan County Prison Camp, to Heater Well Co., 209 South McDowell St., Raleigh, $1,330. Bids Apr. 16. W. L. Craven, Raleigh, hy. engr.

O., Baltimore—City, constructing waterworks system, Contr. 3, elevated tank, to Chicago Bridge & Iron Wks., Rockefeller Bldg., Cleveland, $11,560. **P.W.A.**

Pa., Edgeworth—Edgeworth Water Co., water softening plant, 1 story, 32x40 ft., brick addition to pumping plant, copper, nickel, c.i., c.i. galvanized piping, softening and pumping equipment, to E. H. Dobsen Co., 145 Wetland Dr., Pittsburgh. Noted May 6, C. D.—May 14, E. N.-R.

Tex., Crane—City, c/o F. H. Woodward, mayor, extensions and improvements to present waterworks system, valves, pipe and fire hydrants, to Winslett & Friday, Dallas. $28,221. Est. $35,000. Awarded May 9. **P.W.A.** approved contract.

Wis., Bloomington—Village, constructing well, to C. W. Varner, Dubuque, Ia., $4,450. Bids Apr. 30. Noted May 12, C. D.—May 14, E. N.-R.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Kan., Russell—City soon takes bids sewer extensions. Black & Veatch, 4706 Broadway, Kansas City, Mo., engrs.

Kan., Summerfield—City making plans sewers and waterworks. Application made to W.P.A. for aid to finance same. Paulette & Wilson, 903 National Reserve Bank Bldg., Topeka, and 311 Farmers Union Bldg., Salina, engrs.

La., Rodessa—Caddo Parish plans sanitary sewerage system. J. O'Neill, New Orleans, engr.

Mo., Seneca—City, indefinitely postponed construction sewerage system pending allocation of P.W.A. funds. $50,000. A. C. Moore, Joplin, engr. Noted Mar. 11, C. D.—Mar. 19, E. N.-R.

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Projects $500,000 and over symbol ★
Reports noted back to former issues are designated as follows:
C. D. Construction Daily
E. N.-R. Engineering News-Record
Federal Government projects symbol †

◆

★ **N. Y., Tonawanda**—Town Bd. authorized A. Krehbial, engr., to make survey for storm and drain sewer to serve as flood control measure in Deerhurst Park Sect. $2,000,000. Materials to cost $600,000.

O., Columbus—City plans sanitary sewer in Indian Springs Dist., Contr. 77, Part 4, $30,000; storm sewers in High St. Dist., Contr. 72, Part 3, $15,000; in Oakland Park Dist., Contr. 68, Part 3, $80,000; in Bliss Run Dist., Contr. 76, Part 6, $100,000. P.W.A. project. P. W. Maetzel, City Hall, engr.

Okla., Oklahoma City—City made preliminary plans constructing 18,000 lin.ft. 8 and 10 in. sanitary main and lateral sewers for Hiawatha addition. $28,000. L. M. Bush, city engr.

S. C., Tucapau—See "Waterworks."

Tex., Atlanta—See "Waterworks."

Tex., Conroe—See "Streets and Roads," under Bids Asked.

★ **Man., Winnipeg**—Municipality making plans constructing trunk sewer in Jefferson St. $500,000.

BIDS ASKED

★ **Colo., Denver**—June 10, by City, sewage disposal plant, incl. 2 story administration building, 3 story chemical building, 4 clarifier basins, 4 digestive basins and rectangular filter system, all buildings will be of concrete and specially processed tile to make the plant entirely odorless, located in 35 acre triangle between 52nd and Emerson Sts., on Platte River. $1,171,000. P.W.A. project. Black & Veatch, 4706 Bway., Kansas City, Mo., consult. engrs. Noted Jan. 27, C. D.—Jan. 30, E. N.-R.

N. J., Moorestown—May 25, by Moorestown Twp. Comn., Burlington Co., at Town Hall, Moorestown, constructing, installing sanitary trunk sewer extending in northerly direction from Lenola Rd. to sewage disposal plant, constructing, equipping pumping station at said sewage disposal plant, etc. S. Thornton Hollinshead, twp. engr. P. N. Daniels, consult. engr.

N. J., Plainfield—June 2, by Joint Meeting of city of Plainfield, North Plainfield and Dunellen Boros, Contr. 2, furnishing, installing sludge digestion tank floating covers; Contr. 3 additions and alterations to final settling tanks for sewage treatment plant. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs. P.W.A. project.

N. Y., Albany—See "Contracts Awarded."

N. Y., Brooklyn—May 27, by R. V. Ingersoll, pres. Brooklyn Boro. Boro Hall, storm water and sanitary sewer in East 95th St. from Avenues L and M.

N. Y., Endicott—See "Contracts Awarded."

N. Y., Geneva—May 28, by Bd. P. Wks., constructing sewage treatment plant, incl. sedimentation tank, digestion tank, head house, sludge pump, chlorine equipment, screen and appurtenances, glass covered sludge drying bed, exterior piping, walks, drives, draining and grading. $30,000. P.W.A. project. J. W. Breenan, city engr. N. S. Hill, 112 East 19th St., New York, consult. engr.; adv. E. N.-R. May 21. Noted Apr. 10, C. D.—Apr. 16, E. N.-R.

N. Y., Utica—See "Contracts Awarded."

N. Y., Yonkers—May 25, by Bd. Contr. & Supply, City Hall, A. I. Miller, secy., house and storm sewers in Cooper St. from Cowles Ave. to Hayward St., and from Hayward St. from Cooper St. to Page Ave.; in Homefield

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Pittsburgh DES MOINES STEEL COMPANY

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915 Tuttle St., Des Moines

Sewerage, etc. (Continued)

Section, with 4 northerly tributaries to Odell Ave. To exceed $46,000. P.W.A. project. C. Sheridan, city engr.

Pa., Altoona—See "Contracts Awarded."

Pa., Erie—See "Contracts Awarded."

Va., Clifton Forge—See "Contracts Awarded."

Wis., Menasha—May 28, by Neenah-Menasha Sewerage Comn., Contr. 1, 7,000 lin.ft. 8- to 36-in. sewer in waterways; Contr. 2, 7,800 lin.ft. 10- to 36-in. Divs. B, C and D Sewers; Contr. 3, 13,000 lin.ft. 21- to 33-in. Divs. E and F Sewers, incl. manholes, drop manholes, house connections and appurtenances. Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs.

B. C., Vancouver—See "Contracts Awarded."

LOW BIDDERS

★ **N. Y., New York**—Dpt. Sanitation, T. W. Hammond, comr., 125 Worth St., New York, May 14, from Worthington Pump & Mchy. Co., 2 Park Ave., main sewage service water pumping units Contr. C-1, for Wards Island Sewage Treatment Works, Sect. 3, $160,700; return sludge Contr. C-2 $28,700; excess sludge, Contr. C-3, $25,373***from Ingersoll Rand Co., Inc., 11 Bway., blower units, Contr. D $365,223*** from Dierks Heating Co., 210 East 31st St., heating boilers and settings, Contr. H $16,970. Noted Apr. 6, C. D.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. P. Wks., constructing and repairing ocean outfall sewer at Hyperion, to Hull-Smale & Robinson, 1300 "B" St., Wilmington, $26,400. Bids Apr. 8. Noted Apr. 16, C. D.

Ga., Atlanta—City, constructing South River Sewage Plant, part of general construction, to Northeastern Constr. Co., Winston-Salem, N. C., $239,750; L. A. Walker, city purch. agt., City Hall, constructing sewers and pumps and equipment, to Chicago Pump Co., 2336 West Wolfram St., Chicago, Ill., $1,430. **P.W.A.** Bids Apr. 28. Noted May 5, C. D.—Apr. 23, E. N.-R.

Ia., Chariton—City, constructing sewage disposal plant, to P. E. Johnson & Sons, Chariton, $37,000. **P.W.A.** $13,000 P.W.A. grant.

Md., Frederick—City, sewers, Contr. 6, buildings, tanks, incinerators, etc., to Engstrom & Wynn, Wheeling, W. Va. Est. $160,000. **P.W.A.** Bids Apr. 29. Noted May 13, C. D.—Apr. 23, E. N.-R.

Mass., Somerville—City, J. E. Mullaney, city engr., City Hall, 18 in. clay sewers in Broadway, Cross and Pearl Sts., to Baker & Co., 1335 Hyde Park Ave., Hyde Park, $30,554. **P.W.A.** Bids Apr. 30. Noted May 6, C. D.—Mar. 5, E. N.-R.

N. J., New Providence—City, Contr. A4, for sewer mains, to North Jersey Constr. Co., Inc., 321 Central Ave., Orange, $171,171. **P.W.A.** Bids Apr. 29. Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

N. Y., Albany—City, constructing 9,700 lin. ft. 12 in. sewer in Highland Ave., Glenn, Avon and Magazine Sts., relief labor, $72,774. **W.P.A.** J. J. McManus, city engr. J. W. Carroll, Old Post Office Bldg., procurement officer W.P.A., will purchase materials.

N. Y., Endicott—International Business Machines Corp., Endicott, sewer in Green St. to village main sewage disposal system, own forces. To exceed $23,000. Owner will purchase materials. J. Demarest, c/o owner, engr.

N. Y., Herkimer—Underpinning & Foundation Co., Inc., general contractors, 155 East 44th St., New York, masonry materials for sewage treatment plant, for Village, to Everett Coakley Co., Herkimer; reinforcing steel and structural steel, to Utica Structural Steel Corp., Delaware Ave., Utica. **P.W.A.** Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

N. Y., Long Island City—P. Tomasetti Contg. Co., general contractor, 1074 60th St., Brooklyn, 200 tons reinforcing steel for sewer, to Igo Bros., 234 Poinier St., Newark, N. J., for Queens Boro, Queens Subway Bldg. Noted Apr. 27, C. D.—Apr. 30, E. N.-R., under "Contracts Awarded."

N. Y., Utica—City, City Hall, rein.-con. sewer and earth surfacing in Blandina St. from Genesee to Union Sts., relief labor. To exceed $23,000. **W.P.A.** J. B. Shaw, city engr.

Pa., Altoona—City and Logan Twp., Blair Co., constructing joint twin line 30 in. sewer in 18th St., area, day labor under supervision of H. J. Baum, city engr., City Hall. Est. $25,000. City Purchasing Agent will purchase all materials and equipment. Noted Apr. 10, C. D.—Apr. 16, E. N.-R.

Pa., Erie—City, storm sewerage systems in Garrison Run Rd., Cascade and Liberty Sts., day labor under supervision of D. K. Pulling, deputy city engr. $40,000. A. N. Aitkin, city engr. Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

Pa., Pittsburgh—City, 450 ft. 72 in. brick, concrete sewer in Wood St. near Diamond St., to Parkview Constr. Co., 373 Boquet St., $31,303.

Va., Clifton Forge—F. H. Wheeler, mayor, announces that W.P.A. project designated as 4,260 ft. sewerage pipe line from forks of Dry Creek to Jackson river has been approved by proper authorities. $24,913 of which $21,966 is from federal funds, and $2,948 from city. Work by relief labor.

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Wis., Milwaukee—Sewerage Comn., water wells and reconstruction combustion chambers for disposal plant, to Combustion Eng. Co., 200 South Clark St., Chicago, Ill., $14,565***, sub-contractors, soot conveyor piping, to Diamond Conveyor Co., 37 West Van Buren St., Chicago, Ill., $1,265***air cooled water wall, to M. R. Dietrich, 324 East Wisconsin Ave., $1,959. Grand total $17,789. Bids Apr. 9. **P.W.A.** Noted Apr. 15, C. D.—Apr. 23, E. N.-R.

Wis., Milwaukee — Sewerage Comn., track work, for sewage treatment plant extension, to W. H. Knapp, Inc., 3202 North 37th St., $7,385***bulk loading bins, track scale housing, scale pit, mill construction work, to A. C. Guetzkow, Inc., 5420 West State St., $8,253***sub-bids, steel, to Skobis Co., 2545 North 30th St., $8,400***roofing, to Universal Roofing & Insulation Co., 5402 West State St., $165***sheet metal, to L. Hoffman Co., 117 West Pittsburg Ave., $60***plumbing, to A. A. Hoffmann, 2526 West Greenfield Ave., $60***, rolling doors and windows, to Wauwatosa Fuel & Supply Co., 7700 Horwood Ave., Wauwatosa, $726***glazing, to T. C. Esser, 3107 West Gallina St., 65***electrical work, to Mequon Electric Co., 728 North Jefferson St., $1,780***bulk loading equipment, to Lippmann Eng. Wks., 4603 North Plankington Ave., $11,500***track scale, to Fairbanks Morse Co., 404 North Plankington Ave., $4,970. Grand total $73,503. Bids Apr. 30. **P.W.A.** Noted May 5, C. D.—May 7. E. N.-R.

B. C., Vancouver—Vancouver Joint Sewerage & Drainage Bd., constructing Southhill Trunk Sewer and Still Creek and Bonnette River improvements and miscellaneous work, day labor with relief forces. $75,000. E. A. Cleveland, 500 Beatty St., engr.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Arkansas—See "Streets and Roads, under Bids Asked."

Iowa—State Hy. Comn., Ames, soon takes bids constructing 9 rein.-con. pipe and 6 rein.-con. box culverts on secondary road out of Walnut, N.E. to county line, Pottawattamie Co., incl. 399 cu.yd. Class 1 excav.; 12 rein.-con. pipe and 7 rein.-con. box culverts and extensions, on secondary roads in Butler and Princeton Twps., near McCausland, Scott Co., 488 cu.yd. Class 1 excav.; one 90x20 ft. pony truss bridge and approach fills on secondary road, west of Coin, Page Co., 45 cu.yd. Class 1 and 90 cu.yd. channel excav.; one 170x24 ft. continuous I-beam overhead bridge on secondary road at C. B. & Q. R.R. crossing, north of Hawthorne, Montgomery Co., 310 cu.yd. Class 1 excav.; 120x20 ft. continuous I-beam bridge over east branch of Iowa River, on secondary road, east of Goodell, Hancock Co., 250 cu.yd. Class 1, 130 cu.yd. Class 2 and 580 cu.yd. channel excav.; one 172x24 ft. continuous I-beam overhead bridge on secondary road in Sect. 13, Big Grove Twp., at C. R. I. & P. R.R. crossing, Johnson Co., 330 cu.yd. Class 1 excav. F. R. White, ch. engr.

Iowa—State Hy. Comn., Ames, soon takes bids constructing 2 corrugated metal pipe culverts, 8 rein.-con. pipe culverts and extensions, and 4 rein.-con. box culverts and extensions on secondary road from Oakland Mills North to U. S. Road 34, Henry Co., incl. 222 cu.yd. Class 1 excav.; 14 rein.-con. pipe culverts, 3 rein.-con. concrete box culverts, 309 cu.yd. Class 1 excav.; one 210x24 ft. continuous I-beam bridge, 180 cu.yd. Class 1 and 175 cu.yd. Class 2 excav., in Guthrie Co.; one 130x24 ft. continuous I-beam overhead bridge on secondary road south of Eldora, Hardin Co., 190 cu.yd. Class 1 excav.; one 130x24 ft. continuous I-beam overhead bridge on secondary road, west of Atkins, Benton Co., 190 cu.yd. Class 1 excav. F. R. White, ch. engr.

New Jersey — Delaware River Joint Toll Bridge Comn., Trenton, plans repairing bridges at Riegelsville, Milford, Belvidere, Delaware and Frenchtown, N. J., and Upper Black Eddy, Pa., and Portland, Pa., damaged by winter floods, $100,000. L. Focht, State House, engr.

New Jersey—State Hy. Dpt., Trenton, E. D. Sterner, comr. agreed with Pennsylvania R. R. for elimination of grade crossing, Route 35, South Amboy, Middlesex Co., $100,000. P.W.A. project.

New York—Dpt. P. Wks., State Bldg., Albany, soon takes bids 105 ft. bridge on Mountain Rd., in Allegany Co. $35,500.

North Carolina—State Hy. and P. Wks. Comn., Raleigh, preparing plans to construct underpass under Southern R.R., on connection between Linwood St. and Air Line Ave., Project 435, Gastonia Co. $52,000.

O., Youngstown—State Hy. Dpt., Columbus, soon takes bids Wick Ave. Grade Separation, incl. retaining wall built along Wood St. About $300,000. Awaiting Federal Approval from Washington, J. W. Taylor, Youngstown, resident engr.

Pennsylvania—See "Streets and Roads under "Bids Asked."

★ **Tenn., Memphis**—City Commission adopted ordinances providing for $1,000,000 grade separation program, consisting of $320,000 subway on Florida St. under Frisco, N. C. and St. L. and Union R.R. tracks; $225,000 under-

†*Federal Government*

Bridges, etc. (Continued)

pass on McLean St. under N. C. and St. L. R.R., and $355,000 viaduct on Jackson Ave., over Union R.R. and L. and N. tracks west of Scott St. Cost of constructing 4 projects will be paid by State out of Federal funds. City and railroads will divide cost of right-of-ways and property damage. Program also includes a viaduct on South Parkway over Illinois Central R.R. tracks, ordinance for this project has not been presented for consideration.

BIDS ASKED

Arkansas—See "Streets and Roads."

Arkansas—May 27, by State Hy. Dpt., Little Rock, rein.-con., structural steel railroad underpass and grading, concrete paving, drainage on Mansfield-Waldron Rd., Scott Co., $80,000; rein.-con. overpass over Missouri-Pacific R.R., Saline Co. $40,000. W. W. Zass, 316 Fern St., Little Rock, engr.

Indiana—June 2, by State Hy. Comn., State House Annex, Indianapolis, constructing 396 ft. rein.-con. bridge over Pennsylvania R.R. and U. S. Rd. 30, north of Knox; 252 ft. and 108 ft. rein.-con. girder bridges over New York Central R.R. and Ardmore Trail, west of South Bend, St. Joseph Co.; 105 ft. rein.-con. bridge over Southern Ry., Bretzville, Dubois Co.; 410 ft. steel beam bridge and 24 ft. rein.-con. arch bridge over C. M. and St. Paul Ry. and Talley Creek, near New Goshen, Vigo Co.; 63 ft. steel girder and rein.-con. bridge over New York Central and St. Louis R.R. tracks, Noblesville, Hamilton Co.; 56 ft. steel and rein.-con. underpass under E. J. and E. Ry., Gary, Lake Co.; 200 ft. rein.-con. girder and 150 ft. steel beam bridge over C. and O. and C. & E. Rys., Highland, Lake Co. M. R. Keefe, state hy. engr.

Kansas—See "Streets and Roads."

Louisiana — May 27, by State Hy. Comn., Baton Rouge, constructing Calcasieu River Bridge, consisting of forty-five 22 ft. steel I-beam approach spans, supported on timber pile bents and 210 ft. cantilever I-beam span, supported on 4 rein.-con. piers, etc., Oakdale-Elizabeth Hy., Route 22, P. 982, WPMS 309, Allen Parish; ten I-beam span bridge, Spring St., Shreveport, Route 4, P. 1859, WPGM 319, Caddo Parish; adv. E. N.-R., May 21.

New Jersey—May 25, by E. D. Sterner, comr., State Hy. Dpt., Trenton, constructing grade crossing elimination, Route S-40 and Central R.R. of New Jersey, Woodland Twp., consisting of single track bridge and highway underpass, incl. 41,456 cu.yd. roadway excav.

New York—June 4, by Triborough Bridge Authority, 111 Eighth Ave., New York, constructing entrance pylons and service buildings, Grand Central Parkway Extension, Queens Connection of Triborough Bridge, connecting Manhattan, Bronx and Queens Boros. P.W.A. project. P. Loeser, dir.; adv. E. N.-R., May 21.

N. Y., Cortland—See "Contracts Awarded."

Ohio—May 26, by J. J. Jaster Jr., Hy. Dir., Columbus, constructing Bridge Ma-62-148, grade crossing elimination with Erie R.R. building highway overhead structure, incl. grading, draining, paving city street 0.072 mi. part Youngstown Sect. on Youngstown Sharon Rd. State Hy. 331, U. S. Route 62, WPGM 524-D, Mahoning Co. $226,841; constructing Bridge WA-22-30 grade separation open spandrel concrete arches with concrete beam approach spans over Pennsylvania R.R. and Little Miami River, part Sect. T-1 part Sect. T-2 WPGH 563-E Cincinnati Zanesville Rd. State Hy. 10, State Route 3, U. S. Route 22, Warren Co. $250,458.

Ohio—See "Streets and Roads."

O., Hamilton—June 12, by Comrs. Butler Co., constructing two 105 ft. span steel truss highway bridge concrete pier and abutments over Fourmile Creek on Hamilton Eaton Rd. $48,000. Bids Mar. 20, rejected. F. Hammerle, Court House, engr. Noted Feb. 26, C. D.—Mar. 5, E. N.-R.

★ **Tex., Port Arthur**—June 10, by State Hy. Comn., Austin, Contr. 2, superstructure of Neches River Bridge. Est. of superstructure $1,350,000, total est. of bridge $2,150,000. G. G. Wickline, Austin, bridge engr. Ash Howard-Needles & Tammen, 1010 Orear-Leslie Bldg., Kansas City, Mo., engrs.; adv. E. N.-R., May 21.

Wisconsin—May 26, by State Hy. Comn. and County Hy. Coms. Chippewa, Clark, Dunn, Pierce, St. Croix and Taylor Counties, at Eau Claire, Bridge 172, one 100 ft. span high truss structure, Cadott Ladysmith Rd., Cornell Holcombe Rd., S.T.H. 27, State Project 6301, Sect. 3, Chippewa Co.; constructing one 3½x5x51 ft., one 3½x6x47 ft. and one 8x4½x18 ft. rein.-con. culverts, 16½ ft. R. & L., two 24 ft. 7 in. concrete, steel timber spans, Ellsworth Baldwin Rd., U. S. Hy. 63, State Project 6348, Contr. 2, Pierce Co.; constructing Bridge 169, three 60 ft. I-beam spans, rein.-con. slab and abutments, Bloomer New Richmond Rd., S.T.H. 64, State Project 6229, Dunn Co.; constructing one 3½x6x48 ft. rein.-con. culvert, one 20 ft. span I-beam structure, one 3½x6x48 ft. rein.-con. culvert, Ellsworth Baldwin Rd., U. S. Hy. 63, State Project 6347, St. Croix Co.

Wis., Racine — May 29, by H. A. Nelson, comr. P. Wks., constructing 160 ft. rein.-con. bridge over Root River, at Lafayette St., incl. 40 ft. roadway, two 7 ft. sidewalks. $250,000. Noted Apr. 27, C. D.—Apr. 30, E. N.-R.

CONTRACTS AWARDED

Alabama—See "Streets and Roads."

Ala., Birmingham—City, constructing two 25 ft. span rein.-con. bridge over Village Creek at L. and N. R.R., to B. J. Reid, 2109 North 14th St., **$21,670**; constructing two 25 ft. steel, concrete double box culvert at Village Creek and Huntsville Rd., to H. Cargile Constr. Co., 2212 South 20th Ave., **$12,288.** Noted May 5, C. D.

Arizona—State Hy. Dpt., Phoenix, concrete, steel bridge and grading, draining, oiling part of roadway, in Apache Co., to K. Hodgman, 714 Plymouth Rd., Pasadena, Calif., **$44,724.** Bids May 7. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

Ariz., Winslow—State Hy. Comn., Phoenix, constructing subway underpass on Winslow-Pina Hy., to R. C. Tanner Constr. Co., Phoenix, **$103,996.** Est. $134,000. Bids May 1. Noted May 7, C. D.—Apr. 23, E. N.-R.

Arkansas—State Hy. Dpt., Little Rock, rein.-con. overpass and concrete pavement St. Louis and South Western Ry., Rison, Cleveland Co., to D. F. Jones Constr. Co., Pyramid Life Bldg., Little Rock, **$34,312.** Est. $40,000. Bids May 6.

Arkansas—State Hy. Dpt., Little Rock, rein.-con. and structural steel overpass, 0.37 mi. grading, concrete pavement over St. Louis-San Francisco R.R., Imboden Co., to C. F. Lytle, 504 Nebraska St., Sioux City, Ia., **$178,856.** Est. $220,000. Bids May 6. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

Arkansas—See "Streets and Roads."

California—C. H. Purcell, state hy. engr., Los Angeles, structural steel deck truss bridge with concrete deck across Santa Margarita River, San Diego, Co., to C. W. Wood, Stockton, **$175,529.** Bids Apr. 30. Noted May 4, C. D.

California — State Hy. Comn., Sacramento, constructing overhead crossing over tracks of Great Northern Ry., near Nusieser Station, Lasser Co., to Poulos & McEwen, 2522—17th St., Sacramento, **$61,730.** Bids Apr. 29. Noted May 4, C. D.

Connecticut—See "Streets and Roads."

Connecticut—Merritt, Chapman & Scott Corp., general contractors, 292 Pequot Ave., New London, Conn., and 17 Battery Pl., New York, 550 tons reinforcing steel for bridge over Connecticut River, between Middletown and Portland, for State Hy. Dpt., Hartford, to Jones & Laughlin Steel Service Corp., Long Island City, N. Y. Noted Mar. 23, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

★ **Illinois**—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, erecting structural steel bridge in Fulton and Mason Counties, to Strobel Constr. Co., 53 West Jackson Blvd., Chicago, **$61,968*****substructure for subway in Macoupin Co., to Richardson Constr. Co., Decatur, **$25,165*****erecting and structural steel for subway in Chicago, Cook Co., to F. K. Ketler Co., 105 West Monroe St., Chicago, **$32,310*****structural steel for same project, to American Bridge Co., 208 South LaSalle St., Chicago, **$17,770***** painting same project, to Franz Decorators, 1720 South Halstead Dr., Chicago, **$3,900***** substructure subway in Chicago, Cook Co., to E. L. Archibald Co., 111 West Washington St., Chicago, **$76,963*****floor and rail for same project to Strandberg Bros. Co., 608 South Dearborn St., Chicago, **$58,157*****superstructure for bridge at Stark Co., to Vierling Steel Co., 313 West 23rd St., Chicago, **$23,871***** superstructure for subway structure in Macoupin Co., and superstructure for subway structure in McHenry Co., to R. C. Mahon Co., 231 South LaSalle St., Chicago, **$39,313** and **$21,974** respectively***substructure and paved approaches for viaduct in Bureau Co., to Dungey & Cochran Constr. Co., Marion, **$34,546*****viaduct in Bureau Co., to Illinois Steel Bridge Co., Jacksonville, **$19,834*****bridge in Jackson Co., from Regenhardt Constr. Co., Cape Girardeau, Mo., **$13,737*****substructure for viaduct in Peoria Co., to F. Lorenz, Inc., Chicago Heights, **$92,430*****floor and rail and erecting steel, same project, to W. J. Howard, Inc., 10 South LaSalle St., Chicago, **$78,398*****structural steel for same, to Vincennes Steel Corp., Vincennes, Ind., **$42,191*****bridge and retaining wall in Lake Co., to M. K. McDermott & Co., 53 West Jackson St., Chicago, **$205,129*****2 bridges in Christian Co., to M. C. Robinson, Girard, **$11,401*****substructures and erecting steel for bridges in Lake Co., to O. Randolph, Inc., 52 West Jackson St., Chicago, **$115,425*****bridge in Richland Co., to J. R. Burner, Oblong, **$11,086*****pedestrian subway in Cook Co., to P. J. Crowley & Co., Maywood, **$46,024*****substructure for subway in Cook Co., to Superior Concrete Constr. Co., 1722 East 56th St., Chicago, **$38,185*****2 bridges and culvert in Gallatin Co., to Cunningham Bros., Sumner, **$15,695*****floor and handrail for bridge in LaSalle Co., to Cephas Williams, Streator, **$22,983***** substructure for subway in McHenry Co., to S. J. Groves Sons Co., Libertyville, **$29,143*****bridge in Clinton Co., to Parham Constr. Co., East St. Louis, **$39,031*****bridge and culvert in Whiteside Co., to A. Olson Constr. Co., Waterloo, Ia., **$26,662*****3 bridges in Winnebago Co., to Milburn Bros., Inc., Rockford, **$24,376*****constructing 3 bridges in Lee Co., to Shappert Eng. Co., Belvidere, **$51,749***** bridge in Vermilion Co., to Danville Constr. Co., Danville, **$73,474.** Grand total $1,412,891. Bids Nov. 15, Dec. 13 and 20, Jan. 3 and 31, Feb. 14, Mar. 3, 13 and 27, Apr. 10. Noted Feb. 6, Mar. 18 and Apr. 2, C. D.—Jan. 30, E. N.-R.

Indiana — State Hy. Dpt., Indianapolis, constructing one 28 ft., rein.-con. girder and one 45

†*Federal Government*

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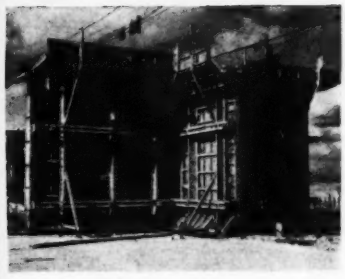
BLAW-KNOX

Construction Equipment



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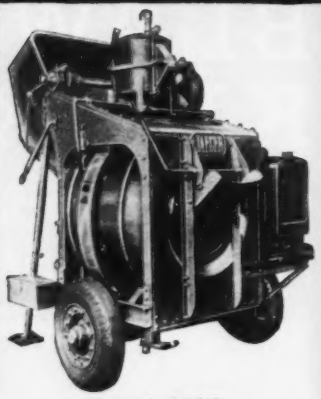

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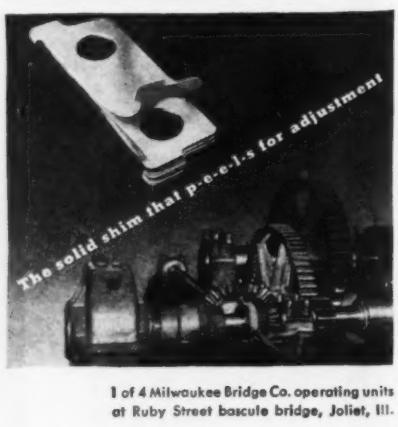

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Bridges, etc. (Continued)

ft. steel beam bridge in Boone Co., to Goodwin & Harvey, Danville, **$25,611** est. $28,147***3 bridges near Danville and 1 at Lizton, rip rap and channel change Milford Creek, to J. C. O'Conner, 2104 Miner Ave., Fort Wayne, **$47,298** est. $58,749. Bids Apr. 28, awarded May 8. Noted May 4, C. D.—Apr. 23, E. N.-R.

Indiana—State Hy. Comn., Indianapolis, 2 bridges in Gibson Co., to M. and P. Corporation, Rockport, **$19,616** est. $19,778***bridge east of Clinton, to E. F. Smith, 3907 North Pennsylvania St., Indianapolis, **$70,000** est. $71,210***bridge in St. Joseph Co., to C. B. Moon Co., 8700 Kinsman Rd., Cleveland, O., **$164,961** est. $178,541. Grand total $254,577. Bids Apr. 7. Noted Apr. 13, C. D.—Mar. 26, E. N.-R.

Kansas—State Hy. comn., at office of County Clerk, Ashland, Bridge No. 4.5, twenty-four 30 ft. I-beam span, P. WPSO 556, to C. E. Gray, Emporia, **$38,453**; Bridge No. 5.0, ten 30 ft. I-beam spans, P. WPSO 556, **$18,367**, both Clark Co. Noted Apr. 14, C. D.—Apr. 16, E. N.-R., under "Streets and Roads."

Louisiana—State Hy. Comn., Baton Rouge, constructing bridge and gravel approaches, on Lamar-Intersection Route 237, Hy., Warsaw Landing, Route 637, Franklin and Madison Parishes, to T. L. James & Co., Ruston, **$23,246**. Bids Apr. 29. Noted May 4, C. D.

Md., Baltimore—Bd. Awards, reinforcing and redecking Belvidere Ave. Bridge, to C. W. Schmidt, Munsey Bldg., **$21,896**. Bids Apr. 29. Noted May 6, C. D.—Apr. 23, E. N.-R.

Minnesota—State Hy. Dpt., St. Paul, constructing Bridge 5473, three beam span underpass, State Project 10-94-21, WPGH 562 A, Washington Co., to Graus Constr. Co., Hastings, **$16,948***Bridge 5373, three beam span overhead, State Project 53-11-39-5, WPGH 379 G, St. Louis Co., to Mesaba Constr. Co., Hibbing, **$16,897***Bridge 5461, beam span underpass, grading 2.027 mi. and standard 64x44 ft. monolithic box culvert, State Project 96-96-21-2A, WPGH 559 A, Washington Co., to E. M. Ganley Co., 2922 Oakland Ave., Minneapolis, **$43,754**. Grand total $77,599. Noted May 1, C. D.—May 7, E. N.-R.

Miss., Greenville—See "Streets and Roads."

Montana—State Hy. Comn., Helena, bridges in Prairie Co., to W. Macklin, Billings, **$24,963** ***in Missoula, to Portland Bridge Co., Yeon Bldg., Portland, Ore., **$154,515**. Bids May 8. Noted May 1, C. D.

★ **New York**—Dpt. P. Wks., Albany, constructing Riverdale Ave. Separation (Henry Hudson Parkway), Bronx Co., to D'Onfro Constr. Co., Albany, **$900,013**. Est. $998,658. Bids Apr. 28. Noted Apr. 9, C. D.—Apr. 16, E. N.-R.

New York—Mid State Builders, Inc., general contractors, Utica, 55 tons reinforcing steel for rein.-con. bridge in Delaware Co., for Dpt. P. Wks., Albany, to L. P. Butts, Inc., Oneonta. Noted May 7, C. D.—May 14, E. N.-R., under "Contracts Awarded."

New York—Transit Comn., 270 Madison Ave., New York, reconstructing bridges carrying tracks of Long Island R.R., Rockaway Branch Div., over 91st Ave. and carrying Myrtle Ave. over same railroad both at Brooklyn Manor, carrying 221st St. over tracks of Long Island R.R. North Side Div., Bayside and related structures, in Queens Boro, to Faircroft Eng. Co., 16 Court St., Brooklyn, **$177,553**. Bids Apr. 3. Noted Apr. 6, C. D.—Mar. 19, E. N.-R.

New York—Triborough Bridge Authority, 111 8th Ave., New York, connecting roads on Randalls Island for Triborough Bridge, Contr. 72, connecting Manhattan Bronx and Queens Boros, to Poirier & McLane Corp., 33 West 42nd St., New York, **$121,150. P.W.A.** Bids May 7. Noted May 8, C. D.—Apr. 30, E. N.-R.

New York—Triborough Bridge Authority, 111 8th Ave., New York, landscaping between anchorage and 70th St., Queens connection Triborough Bridge, Contr. 84, connecting Manhattan, Bronx and Queens Boros., to J. Leopold & Co., Woolworth Bldg., New York, **$342,340**; paving streets adjacent to Bronx Approach connection, Contr. 69, to John Meehan & Son, 90 West St., New York, **$68,453. P.W.A.** Bids Apr. 24, C. D.—Apr. 16, E. N.-R.

N. Y., Amherst—Bd. Supervs., Erie Co., Court House, Buffalo, constructing bridge over Ellicott Creek, on Forest Rd., to Amherst Concrete Co., 51 Edward St., Williamsville, **$24,232**. Bids May 12. Noted May 8, C. D.

N. Y., Cortland—Bd. Supervs, Cortland Co., replacing number of old bridges, incl. rein.-con. bridge on Scott Rd., by own forces. To exceed $23,000. **Maturity soon.**

North Carolina—State Hy. Comn., Raleigh, W. V. Baise, engr., overhead crossing and concrete approaches, P. 6124, Anson Co., to W. F. Bowe, Jr., 540 Reynolds St., Augusta, Ga., **$67,867**. Bids Apr. 15, awarded May 9. Noted Apr. 23, C. D., under "Streets and Roads."

★ **Oklahoma**—State Hy. Dpt., Oklahoma City, constructing 236 ft. I-beam bridge in Beckham Co., to R. R. Tway, 837 East 19th St., Oklahoma City, **$15,865** est. $15,867***134 ft. I-beam overpass in Tulsa Co., to Williams Bros., Philtower Bldg., Tulsa, **$41,103** est. $52,591 ***138 ft. overpass in Woods Co., to Brooks & Dahlgren, Insurance Bldg., Oklahoma City, **$49,898** est. $56,401***1,340 ft. overpass and bridge in Okmulgee Co., to Moran & Buckner, Muskogee, **$210,389** est. $225,987***59 ft. underpass in McClain Co., to Gibson & Hibson, Pauls Valley, **$45,064** est. $48,331***[illegible] ft. bridge in Garvin Co., to Classen & Vesable, Beaver, **$6,447** est. $6,533***43 ft. underpass in Bryan Co., to Lee Harris, Cushing, **$[illegible]** est. $34,530. Grand total $412,173. Bids May 5. Noted Apr. 28, C. D.

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, encased I-beam underpass and bituminous on native stone or modified stone surfacing 1.07 mi. Route 259, Sect. 1, [illegible] Twp., Montour Co., to C. Riebe, Lancaster, **$68,535**; 6,850 ft. plate girder underpass bridge, rein.-con. pavement, earth shoulders and rein.-con. and bituminous surface flares, grading, drainage of roadbed for railroad tracks, Route 168, Sect. 4, Paradise Twp., Mt. Pocono Borough, Monroe Co., to H. J. Williams Co., Inc., Sumner St. and W. M. R.R., York, **$46,867**. Bids Apr. 24. Noted Apr. 30, C. D., under "Bridges and Grade Crossings and Apr. 16, E. N.-R., under "Streets and Roads."

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, rein.-con., steel viaduct, rein.-con. pavement, rein.-con. bridge and relaid brick pavement 1.7 mi. Route 246, Sect. R-1, Jackson and Lancaster Twps., Zelienople Borough, Butler Co., to McCrady Constr. Co., 239 4th Ave., Pittsburgh, **$227,080.** Bids Apr. 9. Noted Apr. 14, C. D.—Apr. 2, E. N.-R.

Pennsylvania—See "Streets and Roads."

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, May 1, fabrication and erection complete of a through steel truss bridge, bituminous on native stone paving, shoulder grading, on 878 ft. Route 58026, Sect. 1, Osceola Twp., Tioga Co., to C. L. Johnson, Mansfield, **$41,540.** Bids May 1. Noted May 8, C. D., under "Bridges and Grade Crossings" and Apr. 23, E. N.-R., under "Streets and Roads."

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, 3 span pony truss bridge, bituminous on crushed stone or native stone base paving hy. on Route 593, Sect. 1, Hopewell Boro, Hopewell and Broad Top Twps., Bedford Co., to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, **$69,730;** deck-plate girder underpass and rein.-con. culvert, rein.-con. paving on Route 276, R-1-A, Cresson Twp. and Borough, Cambria Co., to G. A. and F. M. Wagman, Dallastown, **$142,047.** Bids Apr. 17. Noted Apr. 23, C. D.—Apr. 9, E. N.-R.

Texas—G. Gilchrist, state hy. engr., Austin, constructing 2 rein.-con. bridges, Hy. 35, F.A.P. 280, reopened, and Unit 3, 201, reopened, Unit 2, Shelby, Rusk and Nacogdoches Counties, to W. S. Crawford Co., 4123 Avondale St., Dallas, **$74,260.** Est. $80,000. Bids Apr. 29. Noted May 7, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing Missouri, Kansas & Texas R.R. overpass and roadway approaches, Hy. 5, WPGM 595-G and E. Cooke Co., to F. Parrott, Dallas, **$87,347.** New **P.W.A.** Bids Feb. 25, just awarded. Noted Mar. 3, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing T. and P. R.R. underpass and roadway approaches Hy. 8, Harrison Co., to J. F. Buckner, Cleburne, **$57,237.** Est. $60,000. Bids Mar. 17. New **P.W.A.** Noted Mar. 25, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing T. and N. O. R.R. underpass and approaches Hy. 29, Goliad Co., to Austin Bridge Co., 1813 Clarence St., Dallas, **$60,759.** Est. $65,000. New **P.W.A.** Bids Apr. 29. Noted May 6, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing H. and T. C. R.R. underpass, Hy. 20, W.P.G.H. 236, Washington Co., to Austin Bridge & Road Co., 1813 Clarence St., Dallas, **$51,706.** Est. $60,000. Bids Apr. 28. New **P.W.A.** Noted May 5, C. D.

Virginia—See "Streets and Roads."

Wisconsin—See "Streets and Roads."

STREETS AND ROADS

BIDS ASKED

Arkansas—May 27, by State Hy. Dpt., Little Rock, grading, drainage, 1 untreated timber bridge, traffic service gravel surfacing 7.7 mi. hy., Crawford Co., involving 275 cu.yd. earth, 981 cu.yd. rock and 16,589 cu.yd. unclassified excav., $40,000; grading, drainage, bituminous on gravel surfacing 1.1 mi. junction of West St. and hy., Howard Co., 701, cu.yd. common excav., $20,000; grading, drainage structures, concrete paving 0.6 mi. hy., Ashley Co., 2,844 cu.yd. excav., $40,000; grading, traffic service gravel surfacing 0.2 mi. hy., Saline Co., 31,251 cu.yd. unclassified excav., $20,000; 0.55 mi. hy., embankment approaches to St. Louis-San Francisco R.R. overpass, Randolph Co., 12,818 cu. yd. rock and 50,051 cu.yd. unclassified excav., $40,000; grading, drainage, 2 untreated timber bridges and traffic service gravel surfacing 8.5 mi. hy., Dallas Co., 31,925 cu.yd. common excav., $40,000.

Arkansas—May 27, by Hy. Dpt., Little Rock, grading, drainage, traffic service gravel surfacing 5.1 mi. White, Jackson, Bald Knob and Denmark Counties, incl. 14,780 cu.yd. unclassified excav. $40,000; grading, drainage, concrete paving, 1.6 mi. Pulaski Co., 15,498 cu.yd. common excav., $40,000; grading, drainage, bituminous base course and bituminous surfacing 1 mi. Stone Co., 2,898 cu.yd. unclassified excav., $20,000; grading, drainage, bituminous

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Streets and Roads (Continued)

surfacing 1.8 mi. Sharp Co., 6,157 cu.yd. unclassified excav., $40,000; grading, drainage, gravel base course, bituminous surfacing 2 mi. Baxter Co., 5,476 cu.yd. unclassified excav., $40,000; grading, drainage, constructing 1 untreated timber bridge and traffic service gravel surfacing 6.6 mi. Franklin Co., 16,635 cu.yd. unclassified excav., $40,000; grading, drainage, constructing 6 untreated timber bridges, traffic service gravel surfacing 7 mi. Drew Co., 39,618 cu.yd. common excav., $40,000; grading, drainage, traffic service gravel surfacing, on Paragould Marmaduke Rd. Greene Co., 94,300 cu.yd. excav., $60,000. M. W. Zoss, 316 Fern St., Little Rock, engr.

Arkansas—State Hy. Dpt., Little Rock, received no bids May 6, grading, drainage structures 8.9 mi. Hackett-Greenwood Rd., Sebastian Co., $60,000; grading, drainage, traffic service gravel surfacing 1.3 mi. hy. Faulkner Co., $20,000; grading, drainage, bituminous surfacing 1.8 mi. hy. Sharp Co., $40,000; grading, drainage, 3 untreated timber bridges, traffic service gravel surfacing 7.4 mi. hy. Ashley Co., $40,000. State Hy. Dpt., Little Rock, rejected bids May 6, grading, bituminous on gravel base course surfacing 0.2 mi. Intersection No. 3 and Huntington Ave., Craighead Co., $20,000. Noted May 4, C. D.—May 7, E. N.-R.

Conn., Stratford—See "Contracts Awarded."

Kansas—May 29, by State Hy. Comn. at office County Clerk, Lawrence, roadside improvement, bituminous mat surfacing, resurfacing, keystone for cover material, limestone for cover material, earthwork, culverts, concrete paving, scale house and approaches on 70.211 mi. hys. in Shawnee, Riley, Osage, Marshall, Jackson, Leavenworth, and Douglas Counties.

Kansas—June 2, by State Hy. Comn. at office of County Clerk, Ashland, earthwork, culverts, light type surfacing, bridging, curbing, bituminous mat surfacing, concrete paving, guttering, etc. 150.102 mi. hys. in Stevens, Stanton, Scott, Morton, Meade, Lane, Kearny, Hodgeman Haskell, Gray, Finney and Clark Counties.

Kansas—June 4, by State Hy. Comn. at office of County Clerk, Philipsburg, light type surfacing, bituminous mat surfacing, levee, jetties, concrete rip rapping, earthwork, culverts, bridging, and oil penetration surfacing 88.365 mi. hys. in Grove, Graham, Osborne, Phillips, Rooks, Smith and Trego Counties.

Kan., Kansas City—City soon takes bids asphaltic concrete on rein.-con. paving Quindoro Blvd. from 17th to 27th Sts. $160,000. C. E. Peterson, City Hall, engr.

Maine—State Hy. Comn., L. D. Barrows, ch. engr., Augusta, taking bids gravel surfacing 0.77 mi. Project WPH 299-A, Grand Isle; 1 mi. P. WPMS 304, Bath; 1.27 mi. P. WPMS 349-B, Portland; 1.74 mi. P. WPMS 350, Portland; 0.88 mi. P. WPMS 351, South Portland. Bids Apr. 29 rejected. Noted May 5, C. D.

Minnesota—State Hy. Dpt., rejected bids Apr. 17, grading 2.3 mi. State Project 152-129-24, Fed. Aid Project 473 E. Clearwater Co., incl. 144,906 cu.yd. excav. $40,000. May readvertise.

Mo., St. Joseph—May 27, by City, grading, concrete paving Doniphan, 29th, Woodson, Carnegie, 22nd, 28th Sts. P.W.A. project. H. B. Judson, city engr.

Mo., St. Louis—June 9, by Bd. P. Serv., City Hall, asphalt concrete surfacing 318 ft. Skinker Rd., $11,820; rein.-con. paving North Florressant Ave., 13th and Mullanphy Sts., $127,120. P.W.A. project. L. A. Pettus, city engr.

New Hampshire—May 28, by State Hy. Dpt., Concord, 4 in. on 4 in. gravel paving 0.65 mi. Wilton Rd., Temple, Hillsboro Co., involving 3,968 cu.yd. earth and 228 cu.yd. ledge rock excav., $7,500; 4 in. on 9 in. gravel paving 0.61 mi. Deering Rd., Weare, Hillsboro Co., 2,363 cu.yd. earth and 143 cu.yd. ledge rock excav., $9,000; 4 in. on 4 in. gravel surfacing 1.041 mi. Brattle St., Webster, Merrimack Co., 193 cu.yd. rock and 1,186 cu.yd. earth excav., $7,500; 3.067 mi. Mountain Rd., Marlboro and Jeffrey, Cheshire Co., 12,000 cu.yd. earth and 5,000 cu.yd. rock excav., $45,000. O. P. Riford, Concord, engr.

New Jersey—June 1, by E. D. Sterner, comr. State Hy. Dpt., Trenton, grading, gravel surfacing 74,412 sq.yd. Monmouth Rd. from Springfield Twp. line to Monmouth Ocean County line, Pub. Wks. Project WPSO 156, Burlington Co.; adv. E. N.-R., May 21.

★ **New Mexico**—May 28, by State Hy. Dpt., Santa Fe, grading, drainage, structures 7.5 mi. FAP 82, reopened, Lincoln Co. $219,356; grading, drainage structures, base course surfacing 6.623 mi. F.A.P. 13B Reo, Valencia Co. $174,115; 9.81 mi. W.P.S.S. 239A, Taos Co. $75,301; grading, minor and major drainage structures, 2 course surfacing and miscellaneous construction 4.705 mi. F.A.P. 115 Reo, Valencia Co. $99,465; landscaping 0.732 mi. N.R.H. 125A, Valencia Co. $8,402. Total $576,693. G. F. Conroy Santa Fe, state hy. engr.

N. Y., Chazy—See "Contracts Awarded."

N. Y. Elma—See "Contracts Awarded."

N. Y., St. George—May 28, by J. A. Palma, pres. Richmond Boro, Boro Hall, bituminous concrete paving Richmond Terrace and Richmond Rd.

★ **Ohio**—May 26, by J. J. Jaster, Jr., Hy. Dir., Columbus, grading, drainage structures, widening, cold mixed, cold laid asphaltic concrete surface course or concrete paving 0.697 mi. Oak Harbor Sect., Bowling Green Port Clinton Rd., State Hy. 279, State Routes 105 and 163, on Oak Harbor Sect. of Oak Harbor Genoa Western Rd., State Hy. 439, State Route 163, village of Oak Harbor, Ottawa Co., $45,824; grading, drainage structures, traffic bound surface course paving 1.506 mi. Koenig Rd. WPSO, Project 966 A, Auglaize Co., $10,378; 3.749 mi. New Franklin Lisbon County Rd., WPSO 928 A, Columbiana Co., $19,183; 3.016 mi. Jericho Rd. County Hy. 33, WPSO 912 A, Defiance Co., $18,580; 1.591 mi. Sect. A, Heywood Rd., County Hy. 24, WPSO 872 A, Erie Co., $9,306; 3.342 mi. Mudsock Lecta Rd., County Hy. 24, WPSO 1022 A, Gallia Co., $20,177; 3.01 mi. Sects. C and D, County Hy. 256, WPSO 935 A, Portage Co., $12,355; 2.586 mi. Township Rd. 226, WPSO 930 A, Jefferson and Buck Twps., Tuscarawas Co., $17,438; grading, drainage structures, stabilized surface paving 3.121 mi. County Hys. 32 and 31, WPSO 881 A, Red Bank Rd., Delaware Co., $22,675; grading, drainage structures, waterbound macadam paving 1.09 mi. Cable Rd., County Hy. 59, WPSO 946 A, Erie Co., $10,572; grading 3.334 mi. Buckeye Furnace Rd. A-5, WPSO 895 A, Jackson Co., $16,340; roadside improvement 1.651 mi. part Sect. L, Columbus Wooster Rd., State Hy. 24, State Route 3, U. S. Route 36, F.A.P. 9, Proposal 1, $3,410; 5.051 mi. Sect. P, same road, State Hy. 24, State Route 3, U. S. Route 36, Proposal 2, $7,446; 0.054 mi. Sect. J, same road, Proposal 3 and 123, $123, all foregoing Knox Co.; grading, draining, brick paving 1.44 mi. and constructing Bridge CU-82-127-A, with steel beams and Bridge CU-82-131, rein.-con. beam bridge over Chippewa Creek, part Broadview Heights Sect., part Brecksville Sect., Twinsburg-Elyria Rd., State Hy. 36, State Route 82, F.A.P. 602 G, Proposal 1, $223,426; grading, drainage structures, brick paving, roadside improvement 0.141 mi. same road, State Hy. 36, State Route 82, Proposal 2, $11,674; grading, drainage structures, concrete paving 5.272 mi., constructing Bridge WA-22-36, concrete with steel beams over Bear Run on part Sects. T-1 and T-2, Cincinnati Zanesville Rd., State Hy. 10, State Route 3, U. S. Route 22, F.A.P. 563 A and B, Warren Co., $181,373; grading, traffic bound surface course paving 0.164 mi. and constructing creosoted timber bridge with steel beam over Nigger Run on Nigger Run Rd., Union Twp., Knox Co., $9,332. Total est. $639,612.

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, rejected bids Apr. 17, grading, drainage, 3 rein.-con. structures 19,091 ft. R-41086, Sect. 1, Moreland and Penn Twps., Lycoming Co. Noted Apr. 23, C. D., under "Streets and Roads," and Apr. 9, E. N.-R., under "Bridges and Grade Crossings."

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, rejected bids May 1, grading, drainage, rein.-con. and masonry bridge 12,499 ft. R-32025, Centre and Brush Valley Twps., Indiana Co.; grading, drainage 6,200 ft. R-47005, Sect. 1, Mahoning and Cooper Twps., Montour Co.; 3,915 ft. R-49091, Sect. 1, and R-283, Ralphe Twp., Northumberland Co. Noted May 8, C. D.—Apr. 23, E. N.-R.

Tex., Conroe—City, H. M. Crighton, mayor, W. P. Terrell, Jr., city secy., received no bids May 1, constructing 116,800 sq.yd. limestone rock asphalt paving and vitr. clay storm sewerage system on various streets. Est. $350,000. P.W.A. project. Will readvertise for new bids soon. A. P. Noyes, Conroe, engr. Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

★ **Wash., Bremerton**—City, W.P.A. allots $212,000 which will be supplemented by $292,000 LID funds, jobs have been divided into 13 LID districts, with each district to call bids separately about June 1 for cement, sand, gravel, expansion joints, sheer bars, expansion tubes, inlet, catch basin, manhole and lamphole appurtenances, form lumber and brick. $504,000. C. D. Casad, City Hall, engr.

Wisconsin—May 26, by State Hy. Comn. and County Hy. Coms. of Chippewa, Clark, Dunn, Pierce, St. Croix and Taylor Counties, at Eau Claire, gravel surfacing 3.491 mi. Cornell Medford Rd., S.T.H. 64, State Project 6361, Taylor Co.; crushed stone surfacing 2.66 mi. Ellsworth Baldwin Rd., U. S. Hy. 63, State Project 6348, Pierce Co.; grading, draining 6.336 mi. Cadott Ladysmith Rd., Cornell Holcombe Rd., State Trunk Hy. 27, State Project 6301, Chippewa Co.; 3.491 mi. Cornell Medford Rd., S.T.H. 64, State Project 6361, Taylor Co.; 2.66 mi. Ellsworth Baldwin Rd., U. S. Hy. 63, State Project 6348, Pierce Co.; 4.56 mi. Pittsville Neillsville Rd., Neillsville Withee Rd., State Trunk Hy. 73, State Projects 6363 and 6328, Sect. 1, Clark Co.

N. B., Fredericton—See "Contracts Awarded."

CONTRACTS AWARDED

Alabama—State Hy. Comn., c/o G. Scott, pres., Montgomery, grading, draining, topsoiling, treated timber bridge 1.874 mi. Georgiana-Skinnerton Rd., WPMS and SO 392, Butler Co., to Saunders and Perkins, Hinesville, Ga., $38,916. Bids Jan. 18. Noted Jan. 27, C. D.

Arizona—State Hy. Comn., Phoenix, grading, drainage 10.7 mi. road in Navajo Co., to Lee Moor Contg. Co., 206 Two Republics Bldg., El Paso, Tex., $160,221***3.9 mi. Showlow-Concho Hy., Navajo and Apache Counties, to Tanner Constr. Co., Phoenix, $36,318. Bids May 5. Noted May 12, C. D.—Apr. 23, E. N.-R.

Arkansas—State Hy. Dpt., Little Rock, grading, drainage traffic service gravel surfacing 7 mi. hy. Arkansas Co., and grading, drainage,

†*Federal Government*

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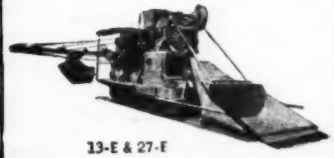
Ransome

SINGLE DRUM and DUAL DRUM PAVERS



13-E & 27-F

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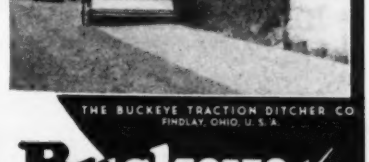

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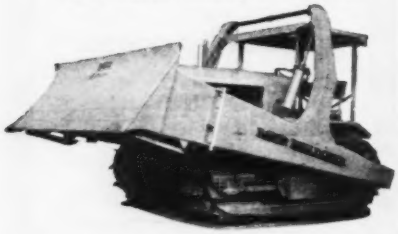
and Road Rooters

* Direct lift makes this possible and saves money on repairs



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JOHN F. STEVENS' RECOLLECTIONS

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ENGINEERING NEWS-RECORD
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Streets and Roads (Continued)

2 untreated timber bridges, traffic service gravel surfacing 6.1 mi. Brough School-Cassoce Rd., Arkansas Co., to McGeorge Contg. Co., Pine Bluff, **$24,485** and **$26,887** respectively, est. $40,000 each***grading, drainage, 3 untreated timber bridges, traffic service gravel surfacing 7.3 mi. Jackson Co., to Batson Bros., Dardanelle, **$28,005** est. $40,000***grading, drainage, 2 untreated timber bridges, traffic service gravel surfacing 5.1 mi. hy. Randolph Co., to H. B. Wall, Pocahontas, **$27,052** est. $40,000 ***grading, drainage, 4 untreated timber bridges, traffic service gravel surfacing 6.3 mi. Clay Co., to Skrainka Constr. Co., University City, Mo., **$27,328** est. $40,000***grading, drainage, 3 timber bridges, traffic service gravel surfacing 5.2 mi. Hempstead Co., to Neal & De Paughter, Waldo, **$20,327** est. $40,000***grading, drainage, gravel base course, bituminous surfacing 0.7 mi. Cleveland Co., to D. F. Jones Constr. Co., Pyramid Life Bldg., Little Rock, **$20,264** est. $40,000***grading, drainage, concrete paving 0.7 mi. Sycamore St. N., Augusta, Woodruff Co., to A. C. Kennedy, Poyen, **$30,605** est. $40,000***grading, drainage, gravel base course and bituminous surfacing 2.4 mi. hy. Benton Co., to Consolidated Constr. Co., 31st St. and Arkansas River, Tulsa, Okla., **$25,974** est. $40,000***grading, drainage, traffic service gravel surfacing 6.6 mi. hy. Scott Co., to D. Keenan, Dardanelle, **$27,254** est. $40,000. Grand total $258,181. Bids May 6. Noted Apr. 24 and May 4, C.D.—Apr. 30, E.N.-R.

Arkansas—State Comn., Little Rock, concrete paving, curbing, apron and platforms, graveling roads, earthwork, drainage around various buildings, to W. Peterson, Donaghey Bldg., Little Rock, **$68,500.** Est. $75,000. **P.W.A.** Bids May 14. Noted May 1, C.D.—May 7, E.N.-R.

★ **Connecticut**—State Hy. Comn., at office J. A. Macdonald, comr., Hartford, waterbound macadam paving 3,898 ft. Butt's Bridge Rd. and rolled bank run gravel surfacing 28,776 ft. Lisbon, Miller and Brooklyn Roads and Water St., Canterbury, and rein.-con. paving 3,950 ft. Route 8, Seymour, to A. I. Savin Constr. Co., 10 Village St., East Hartford, **$82,673** and **$277,780** respectively***rein.-con. paving 18,559 ft. Route 10, Cheshire and Southington to L. Suzio Constr. Co., 98 State St., Meriden, **$116,513*****rein.-con. paving 6,429 ft. Highland Ave., Route 10, Cheshire, and 5,103 ft. White St., Danbury, to N. H. Rd. Constr. Co., 1817 Dixwell Ave., New Haven, **$69,737** and **$69,719** respectively***grading, drainage 22,941 ft. Merritt Parkway, Guinea Rd. to Ponus St., Stamford and New Canaan, to Osborne-Barnes Co., 20 West Danbury St., Danbury, **$598,109** ***20 ft. span bridge and gravel and concrete surfacing on Routes U. S. 6 and 14, Windham, to Alex Jarvis Co., 416 Center St., Manchester, **$9,436*****waterbound macadam paving 2,513 ft. Richard St., Newington, to B. and R. Constr. Co., 1524 Dixwell Ave., Hamden, **$8,926.** Grand total $1,232,892. Bids Apr. 20. Noted Apr. 9, 23 C.D.—Apr. 16, E.N.R.

Conn., Stratford—Town, repairing and improving 10 town streets. Owners build, W.P.A. labor. Est. $58,100. W. Dunbar, Town Hall, engr.

Conn., Torrington—City, bituminous macadam repaving Midgeon Ave., to John De Michiel & Bros., 58 High St., **$23,120.** Est. $25,000.

Illinois—Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, grading 6.49 mi. road in Lee Co., to M. Hayes & Sons, 209 South LaSalle St., Chicago, **$87,342.** Bids Mar. 3.

★ **Illinois**—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, paving 0.47 mi. road in Stephenson Co., to E. M. Rocho, Freeport, **$73,996*****0.36 mi. Macoupin Co., to Madison Constr. Co., Edwardsville, **$59,603*****0.36 mi. Fayette Co., to Mautz & Oren, Inc., Effingham, **$74,843*****5.18 mi. Macoupin Co., to Waukegan Constr. Co., Morton Grove, **$68,800***** 6.11 mi. Kendall Co., to Hydraulic Stone & Constr. Co., Elgin, **$64,327*****3.01 mi. White Co., to C. J. Moritz, Inc., Effingham, **$32,293** ***2.54 mi. Cook Co., to Coliani & Dire Co., West Adams and South Canal Sts., Chicago, **$225,264*****4.82 mi. Knox and Stark Counties and 6.49 mi. Lee Co., to M. Hayes & Sons Co., 209 South LaSalle St., Chicago, **$39,697** and **$87,342** respectively***0.52 mi. Saline Co., to Fiegel Constr. Co., Evansville, Ind., **$34,155***** 0.11 mi. Cook Co., to R. R. Anderson Co., 625 North Kedzie Ave., Chicago, **$69,903***** 1.26 mi. Morgan Co., to Dungey & Cochran Constr. Co., Marion, **$49,021*****0.5 mi. McHenry Co., to G. Welch, Dundee, **$49,787*****1.82 mi. Green Co., to C. E. Reed Constr. Co., Springfield, **$24,050*****0.64 mi. Cook Co., to Western Constr. Co., Forest Park, **$64,713*****1 mi. Cook Co., to J. A. McGarry & Co., 189 West Madison St., Chicago, **$141,887*****2.44 mi. Jasper Co., to Orville Arnold, Casey, **$13,312*****0.28 mi. Macoupin Co., to H. M. Johnson, Mount Olive, **$16,778*****0.42 mi. St. Clair Co., to Concord Constr. Co., East St. Louis, **$106,681*****0.57 mi. Lake Co., to Highways Constr. Co., Highland Park, **$172,985*****0.37 mi. Jackson Co., to Central West Constr. Co., Maywood, **$40,201** ***4.15 mi. Clinton Co., to Sangamo Constr. Co., Springfield, **$111,959*****14.38 mi. Jefferson Co., to Cameron Joyce & Co., Keokuk, Ia., **$79,-085*****0.14 mi. St. Clair Co., to Keeley Bros. Constr. Co., East St. Louis, **$29,604*****0.81 mi. Bureau Co., to S. G. Hayes & Co., 910 South Michigan Ave., Chicago, **$19,966*****3.79 mi. Gallatin Co., to W. H. Laird, Ewing, **$32,877** ***0.76 mi. Vermillion Co., to E. R. Kelly Constr. Co., Mattoon, **$16,492*****0.3 mi. Henry Co., to H. J. Eppel, Pontiac, **$32,575*****4.73 mi. Douglas and Moultrie Counties, to Thornton & Sons, Mattoon, **$18,791*****5.42 mi. Ogle and Whiteside Counties, to Gund Graham, Freeport, **$71,748.** Grand total $1,923,735. Bids Dec. 13, 20, Jan. 3, 31, Feb. 14, Mar. 13 and 27 and Apr. 10. Noted Jan. 24, Mar. 6 and 13, Feb. 6 and Apr. 2, C. D.—Feb. 27 and Jan. 30, E. N.-R.

Indiana — State Hy. Comn., Indianapolis, graveling 8.967 mi. Noble Co., to Glen O'Connor, Culver, **$39,766.** Est. $53,120. Bids Jan. 7. Noted Jan. 10, C. D.

Indiana—State Hy. Comn., Indianapolis, reinforcon. paving 0.456 mi. road in Monroe Co., to Berne Constr. Co., 309 West Washington St., Indianapolis, **$28,373.** Est. $31,306. Bids Apr. 7. Noted Apr. 13, C. D.—Mar. 19, E. N.-R.

Kansas—State Hy. Comn., at office of County Clerk, Ashland (**P. means Project**), to A. L. Cook, Ottawa, earthwork 0.716 mi. P. 556, Clark Co., **$28,034*****to Cook & Waddell, Ottawa, earthwork and culverts 7.358 mi. P. 25-7-FA 492-F, Wichita Co., **$14,497;** earthwork 0.284 mi. P. 25-6-FA 492-G, Kearny Co., $454 ***to Cook & Cone, Ottawa, sand graveling for cover material 7.81 mi. P. 83-4-6765, $1,284; 13.37 mi. P. 160-9-6766, **$2,199,** both Seward Co.; 11.81 mi. P. 96-5-6769, **$2,743;** 11.78 mi. P. 96-6-6770, **$2,737,** both Scott Co.; 11.9 mi. P. 96-7-6771, Lane Co., **$2,763*****to Sam Ore Constr. Co., McPherson, 12.57 mi. P. 54-5-6760, **$2,516;** 4 mi. P. 160-10A-6767, **$800,** both Meade Co.; 12.54 mi. P. 283-1-6762, $2,567; resurfacing 8.19 mi. P. 283-5-6781, $2,424, both Clark Co.***to D. H. Hardman, Alton, sand graveling for cover material 9.64 mi. P. 83-8-6763, Finney Co., **$1,652;** 11.99 mi. P. 83-7-6764, Haskell Co., **$2,055;** resurfacing 10.41 mi. P. 27-7-6775, Hamilton Co., **$4,853*****to A. F. Reis, Topeka, sand graveling for cover material 8.38 mi. P. 27-2-6772, Morton Co., **$2,212*****to Geiger & Rutherford, Leavenworth, concrete paving 0.248 mi. P. 23-4-WPMH 471-E, Part 2, **$35,819;** 0.102 mi. P. 23-5-WPMH 471-E, Part 2, **$14,985,** both Gray Co.***to J. H. Shears Sons, Hutchinson, sand graveling 0.964 mi. P. 27-5-FA 358-F, **$1,024;** light type surfacing 10.629 mi. P. 27-5-FA 358-G, **$10,927,** both Stanton Co.***to M. W. Watson, National Bank of Topeka Bldg., Topeka, resurfacing 12.78 mi. P. 23-5-6779, Gray Co., **$2,991;** 4.07 mi. P. 23-6-6780, Finney Co., **$952;** 9.82 mi. P. 283-7-6784, Ford Co., **$2,710;** 11.49 mi. P. 283-8-6785, Hodgeman Co., **$3,171*****to W. H. Harris, Manhattan, resurfacing 3 mi. P. 283-9-6782, Hodgeman Co., **$756;** 8.5 mi. P. 283-10-6783, **$2,142;** 18.87 mi. P. 4-1E-6773, $4,529; 16.93 mi. P. 4-1F-6774, **$4,063,** all foregoing in Ness Co.***to C. Hulme, Great Bend, resurfacing 5.05 mi. P. 23-1-6776, **$1,757;** 11.58 mi. P. 23-2-6777, **$4,030,** both Meade Co.; 10.52 mi. P. 23-3-6778, Gray Co., **$3,661.** Grand total $167,307. Bids Apr. 28. Noted Apr. 14, C. D. —Apr. 16, E. N.-R.

★ **Louisiana**—State Hy. Comn., Baton Rouge, grading, surfacing 6.91 mi. Lincoln Parish, to Delony & Tatum, Dubach, **$15,866*****2.121 mi. Bienville Parish, to Larance & Henry, Dubach, **$12,983*****3.939 mi. Franklin Co., and 3.549 mi. Franklin Parish, to J. J. McKeithen, Grayson, **$15,543** and **$14,780** respectively*** 4.128 mi. Catahoula Parish, to A. E. Montgomery, Parhams, **$21,054*****3.968 mi. St. Tammany Parish, to R. B. Tyler Co., 1446 Levering St., Louisville, Ky., **$22,407*****2.322 mi. Pointe Coupee Parish and 3.274 mi. St. Charles Parish, to N. Cardinal & Co., Plaquemine, **$12,903** and **$23,830** respectively***2.599 mi. Natchitoches Parish, and 7.799 mi. hy. Evangeline Parish, to Le Blanc Bros., St. Gabriel, **$7,209** and **$19,604** respectively***1.143 mi. De Soto Parish, to Forcum-James Co., Dyersburg, Tenn., **$7,261** ***4.001 mi. St. Landry Parish, to Barber Bros. Contg. Co., Inc., Baton Rouge, **$79,182*****concrete paving 8.203 mi. St. Charles Parish, to T. L. James Co., Inc., Ruston, **$227,257.** Grand total $479,879. Bids Apr. 29. Noted May 8, C. D.—Apr. 16 and 23, E. N.-R.

Maryland—State Roads Comn., Baltimore, macadam paving 1.19 mi. Contr. G-106-1-62, F.A.P.N.R.S. 373-A, Garrett Co., to T. Edgie Russell Co., Frederick, **$28,418.** Bids Apr. 21. Noted May 1, C. D.

Maryland—State Roads Comn., Baltimore, traffic bound macadam paving 1.51 mi. Contr. G-100-1-62, F.A.P. W.P.H. 246-B, Garrett Co., to Cumberland Contg. Co., Cumberland, **$24,633.** Bids Apr. 14. Noted Apr. 20, C. D.—Apr. 9, E. N.-R.

Massachusetts — Commonwealth of Massachusetts, Dpt. P. Wks., W. F. Callahan, comr., 100 Nashua St., Boston, 12,060 sq.yd. bitulithic concrete sidewalks, bituminous macadam widening 15,100 sq.yd. road, Project N.R.S. 255, part, Andover, to John McCourt Co., 910 Huntington Ave., Boston, **$28,519.** Bids Apr. 29, awarded May 6. Noted May 6, C. D.

Minnesota—State Hy. Dpt., St. Paul, grading, stabilized base, surface course 9.3 mi. Bennettville-Aitkin Rd., S.P. 169-35-21, F.A.P. 245, incl. 223,854 cu.yd. excav.; and 4.4 mi. Junction Trunk Hy. 18, and Bennettville, S.P. 169-35-23-2B, F.A.P. 120, 77,673 cu.yd. excav., to Hendrickson Constr. Co., Willmar, **$107,043** and **$39,150** respectively***1.1 mi. between 2 and 3 miles north of Zim, Project 69-10, WPSO 867A, St. Louis Co., 78,698 cu.yd. excav., to Nienaber & Pettyjohn, 606 East 5th St., St. Paul, **$41,224.** Grand total $187,417. Noted Apr. 10, C. D.

Miss., Greenville — Washington County Hy. Comn., at office of Secretary, Weinberg Bldg.,

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†*Federal Government*

Streets and Roads (Continued)

grading, drainage structures, bridging, gravel surfacing, 4.4666 mi. Stoneville-Metcalfe Rd., Washington Co., to Barber Bros. Contg. Co., Baton Rouge, La., **$39,859.** Est. $42,000. **F.W.A.** Bids Apr. 23. Noted May 6, C. D.—Apr. 16, E. N.-R.

Montana—State Hy. Comn., Helena, grading and surfacing 5.094 mi. road in Yellowstone Co. and 2.667 mi. Lake Co., to C. & F. Teaming & Trucking Co., Butte, **$34,265** and **$35,494** respectively***8.423 mi. road in Powder River Co. and 2.587 mi. Rosebud Co., to F. J. Haas, Great Falls, **$63,196** and **$41,489** respectively. Grand total **$174,444.** Bids May 8. Rejected bids May 8, improving 11.383 mi. road in Prairie Co. and furnishing, installing platform scales and driveways near Missoula, Butte, Laurel, Miles City, Great Falls and Culbertson. Noted May 1, C.D.

N. J., Trenton—Council, P. Morton, mgr., bituminous paving for tennis courts for various city playgrounds, to Union Paving Co., Broad and Stiles Sts., Phila., Pa., **$36,253.** Bids May 5.

New York—Dpt. P. Wks., Albany, improving 0.09 mi. road in Suffolk Co., to Young-Fehlhaber Pile Co., Inc., 60 East 42nd St., New York, **$51,365.** Bids Apr. 14. Noted Apr. 22, C. D.—Apr. 2, E. N.-R.

★**New York**—Dpt. P. Wks., Albany, improving 1.28 mi. Sect. 1 and 2.06 mi. Sect. 2, Grand Central Parkway Extension, Queens Co., to Drake & Piper, Inc., Freeport, **$474,227** and **$449,963** respectively, est. $481,190 and $476,505 respectively***2.79 mi. Bethpage Parkway, Nassau Co., to Good Roads Eng. & Constr. Co., Inc., Wantagh, **$516,297** est. $564,835. Grand total $1,440,487. Bids Apr. 17. Noted Apr. 21, C. D.—Apr. 9, E. N.-R.

N. Y., Brooklyn—R. V. Ingersoll, pres. Brooklyn Boro. Boro Hall, to T. Vitanza, 710 Avenue W, regulating Bay 41st St., **$1,427;** West 3rd St., **$2,448***to Mill Basin Asphalt Co., East 54th St. and Avenue U, asphalt paving East 26th St. **$9,255;** East 58th St. **$6,537;** Flatlands Ave. **$5,017;** Foster Ave. **$10,597***to Cranford Co., 149 Remsen St., Wallaston Court, **$3,397***to B. Turecamo Contg. Co., New Croppsey Lane, 85th St. **$6,176.** Grand total $44,855. Bids Apr. 23. Noted Apr. 24, C. D.—Apr. 23, E. N.-R.

N. Y., Chazy—Village, reconstructing with gravel and bituminous materials 3 mi. Statson Rd. from Fire House to Champlain line, relief labor. $30,000. **W.P.A.** J. F. Leeds, South St. School, Glens Falls, procurement officer W.P.A., will purchase materials.

N. Y., Elma—City, repairing, guttering Ostrander, Handy, Knab, Conley, Donnelly, Schultz and Billington Rds., and widening 2,700 ft. Donnelly Rd., and erecting wood guards, relief labor. $30,000. **W.P.A.** Procurement Div., Treas. Dpt., City Hall, Buffalo, will purchase material.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., sheet asphalt repaving on area formerly occupied by car tracks at various locations, to Sicilian Asphalt Paving Co., 41 Park Row, **$20,568;** furnishing, delivering 2 asphalt surface heaters, to Good Roads Equipment Co., 50 Church St., **$5,750.** Bids Apr. 30, awarded Apr. 30. Noted May 1, C. D.

O., Cleveland — City, to Cleveland Quarries Co., Builders Exchange Bldg., stone sidewalks for Northern Dist. **$5,524;** Southerly Dist. **$8,289;** Westerly Dist. **$6,434***to P. H. De Santis, 12502 Britton Dr., cement sidewalks for Northerly Dist. **$18,095***to Concrete Constr. Co., 1254 Mayfield Rd., cement sidewalks for Southerly Dist. **$17,353.** Grand total $55,695. Noted Dec. 19, C. D.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage 4.01 mi. roads in Oklahoma Co., and 4.375 mi. Cleveland Co., to J. J. Thompson, 434 West 35th St., Oklahoma City, **$29,811** and **$29,811** respectively, est. $30,824 and $26,554 respectively***0.97 mi. Osage Co., to J. W. Moorman, Hominy, **$9,057** est. $9,059***3.27 mi. Grady Co., to D. Sweeney, 609 West 11th St., Oklahoma City, **$15,811** est. $15,811***1.8 mi. Kingfisher Co., to Lee Pool Fairview, **$9,258** est. $9,321***4.74 mi. Muskogee Co., to Pharoah & Co., Henrietta, **$24,916** est. $25,467***5.46 mi. Beckham Co., to Merveldt & Stebbins, El Reno, **$30,874** est. $31,469. Grand total $149,539. Bids May 5. Received no bids improving roads in Lincoln, Hughes, Okfuskee, Pittsburg, McIntosh and McCurtain Counties, V. T. Moon, Oklahoma City, state hy. engr. Noted Apr. 28, C. D.

Pennsylvania—At office W. Van Dyke, secy. Hys. Harrisburg, dual type paving, 4 rein.-con. structures 5.03 mi. Route 297, Sects. 1 and 2, Lower and Upper Saucon Twps., Lehigh and Northampton Counties, to Collins & Maxwell, Inc., Easton, **$481,157.** Bids Apr. 9. Noted Apr. 14, C. D.—Apr. 2, E. N.-R.

Pennsylvania—At office W. Van Dyke, secy. Hys., Harrisburg, grading, drainage 1.4 mi. Route 49040, Sect. 2 and 49042, Sect. 1, Upper Augusta Twp., Northumberland Co., and bituminous on native stone surfacing 0.36 mi. Route 755, Sect. 3, Ringtown Borough, Schuylkill Co., to Peffer & Viall, Humelstown, **$10,268** and **$13,995** respectively; bituminous on native stone or crushed stone surfacing, 2 rein.-con. structures 5.85 mi. Route 705, Parks and Bethel Twps., Armstrong Co., to N. B. Putman Co., Fort Wayne, Ind., **$162,925.** Grand total $186,288. Bids Apr. 24. Noted Apr. 30, C. D.—Apr. 16, E. N.-R.

Pa., Wilkes-Barre—City, W. P. Johns, engr., City Hall, bituminous repairs to various paved streets, to C. F. Goeringer Constr. Co., 296 Madison St., **$45,000.**

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures 4.723 mi. State Hy. "F," Bell Co., to D. H. Buchanan Constr. Co., Temple, **$41,442** est. $45,000***grading, drainage structures gravel base course paving 3.615 mi. State Hy. "F," Hood Co., to E. W. Hable, Corsicana, **$40,381** est. $40,000***grading, drainage structures, caliche base surfacing 6.087 mi. State Hy. "F," Lubbock Co., to Field Bros., Lubbock, **$20,490** est. $20,000***grading, drainage structures, gravel surface course paving 4.123 mi. State Hy. "D," Limestone Co., to E. Lloyd, Box 1077, Fort Worth, **$35,417** est. $40,000***grading, drainage structures, disintegrated limestone surface course paving 8.121 mi. State Hy. "F," Hill Co., to J. E. Barnhill, Plainview, **$46,166** est. $50,000. Grand total $183,896. Bids Apr. 28. New **P.W.A.** Noted May, C. D.

★**Texas**—G. Gilchrist, state hy. engr., Austin, grading, drainage structures 2.84 mi. State Hy. 2, Williamson Co., to Cage Bros. and J. C. Ruby, Bishop, **$59,448** est. $60,000***6.706 mi. State Hy. "F," Nolan Co., to E. T. Prater, Memphis, **$30,646** est. $35,000***5.238 mi. State Hy. "F," Madison Co., to Howard Bros., Madisonville, **$26,423** est. $30,000***widening crown and drainage structures 8.274 mi. State Hy. 5, Wichita Co., to Combs & Glade, Wichita Falls, **$124,360** est. $125,000***grading, drainage structures, gravel and disintegrated limestone surface course paving 11.249 mi. State Hy. "F," Hill Co., to J. E. Barnhill, Plainview, **$53,999** est. $60,000***grading, drainage structures, iron ore top soil base course and asphalt surface treating 5.487 mi. State Hy. "F," Van Zandt Co., to Earl Yates & Son, 1109 North Commerce St., Dallas, **$45,723** est. $50,000***grading, drainage structures, caliche road bed treatment 17.507 mi. State Hy. "F," Maverick Co., to W. W. Vann & Co., Kerrville, **$51,346** est. $50,000***grading, drainage structures, triple asphalt on caliche surface treating 1.864 mi. State Hy. 1, Eastland Co., to Womack-Henning Constr. Co., Abilene, **$83,333** est. $85,000***grading, drainage structures, disintegrated limestone on gravel paving 7.212 mi. State Hy. "F," Falls Co., to Central Bitulithic Co., P. O. Box 5343, Dallas, **$33,899** est., $40,000. Grand total $509,177. Bids Apr. 29. New **P.W.A.** Noted May 8, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, cut back asphaltic concrete on crushed gravel caliche base course paving 9.067 mi. State Hy. 1, Hudspeth Co., to West Texas Constr. Co., 501 East Rosedale St., Fort Worth, **$106,360** est. $120,000***grading, drainage structures 5.719 mi. State Hy. 40, Kaufman Co., to Hannah Constr. Co., Professional Bldg., Waco, **$68,451** est. $80,000***widening, concrete paving, partial relocation and partial surfacing with Duraco pavement 4.013 mi. State Hy. 4, Cameron Co., to Briggs-Darby Constr. Co., Pharr, **$62,606** est. $70,000***widening concrete pavement, Duraco paving 7.872 mi. State Hy. 4, F.A.P. 93-A, B and C, Cameron Co., to Austin Road Co., 1813 Clarence St., Dallas, **$92,948** est. $100,000***iron ore top soil base course and road oil surface treating 7.233 mi. State Hy. 43, Rusk Co., to E. Lloyd, Box 1077, Fort Worth, **$37,886** est. $40,000. Grand total $368,251. Bids Apr. 28. Noted May 8, C.D.

Texas—G. Gilchrist, state hy. engr., Austin, grading, small drainage structures 5.4 mi. State Hy. 35, Shelby, Rusk, and Nacogdoches Counties, to James Spencer & Son Constr. Co., Concan, **$71,537** est. $80,000; crushed gravel, cutback asphaltic concrete on caliche paving 9.049 mi. State Hy. 1, Hudspeth Co., to Brown & Root, Inc., 708 Colorado St., Austin, **$98,923** est. $100,000. Bids Apr. 29. Noted May 6, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, grading, small drainage structures 5.436 mi. State Hy. 45, Control 213-3-5, Polk Co., to J. S. Moore & Sons, Lufkin, **$57,094.** Est. $60,000. Bids Apr. 29. State Project. Noted May 6, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures, cut-back asphaltic concrete on gravel paving, shoulders 1.921 mi. State Hy. 16, F.A.P. 131, Bexar Co., to H. B. Zachry, Laredo, **$66,276.** Est. $70,000. Bids Mar. 18. Noted Mar. 25, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, grading, crushed conglomerate or gravel base course surfacing 13.811 mi. State Hy. 66, Control 250-4-4 Erath Co., to Austin Bridge Co., 1813 Clarence St., Dallas, **$74,688.** Est. $80,000. Noted Apr. 28. Noted May 5, C. D.

Utah—State Rd. Comn., Salt Lake City, grading, draining, roadway gravel surfacing 1.931 mi. from Garden City South, Rich Co., to B. D. Palfreyman, Springville, **$19,918** est. $19,398; and constructing steel beam, concrete underpass under Bamberger Electric R.R. at North Farmington, Davis Co., to Bowers Building & Constr. Co., 1033 South State St., Salt Lake City, **$56,527** est. $57,989. Noted Apr. 28, C. D.—Apr. 30, E. N.-R.

Utah—State Rd. Comn., Salt Lake City, grading, draining, gravel surfacing 3.337 mi. state highway on 9 East St. between Vine and Draper Sts., Salt Lake Co., incl. 33,500 cu.yd. unclassified excav., to L. A. Young Constr. Co., Richfield, **$58,872** est. $57,622; constructing underpass and approach roads under D. & R. G. R.R. tracks at Cliff, Emery Co., to W. W.

Federal Government

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FOR
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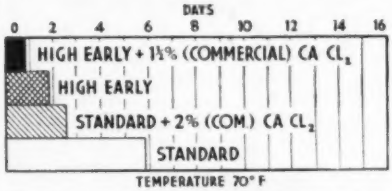

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BROWNING SHOVELS

Streets and Roads (Continued)

Clyde & Co., Springville, **$39,314** est. **$36,485.** Noted **May 1, C. D.**

Virginia—Dpt. Hy. Comn., Richmond, paving 1.14 mi. road south of Manassas, Prince William Co., to Northern Virginia Constr. Co., Inc., Clarendon, **$23,225**•••6.9 mi. roadway on Route 11, Smyth and Wythe Counties, to Pendleton Constr. Co., Inc., Wytheville, **$162,439**•••concrete curbing, guttering 0.298 mi. town of Kilmarnock, to G. T. Baughan, Tappahannock, **$5,191**•••rein.-con. paving 0.2 mi. in Hampton, to Hyatt & Pettit, Suffolk, **$4,125**•••0.48 mi. town of Wise, to R. H. Bolling, Norton, **$6,580**•••surface treating airport South Boston, to F. M. Arthur, South Boston, **$6,347**•••paving and overpass leading to Robert E. Lee Bridge, Richmond, to Atlantic Bitulithic Co. of Washington and Richmond, **$20,182** and **$13,226** respectively. Grand total $241,315. Bids May 4. Noted May 11, C. D.—May 14, E. N.-R.

Wash., Ellensburg—Kittitas Co., constructing 6.75 mi. highway Park Creek-Johnson Creek Loop Hy., to T. Scalzo, 1829 Lane St., Seattle, **$35,755.** R. P. **Ryker**, Court House, engr. Noted Apr. 2, C. D.

★ **Wisconsin**—State Hy. Comn., Madison, grading, draining, concrete surfacing 6.325 mi. Adams Co., and concrete surfacing 7.391 mi. Trempealeau Co., to F. F. Menzel Co., Wisconsin Rapids, **$188,099** and **$167,969** respectively•••concrete surfacing, grading 7.406 mi. Monroe Co., to Universal Eng. Co., Medford, **$153,029**•••concrete surfacing 11.318 mi. Polk Co., to Weymouth Constr. Co., 4001 North Prospect Ave., Milwaukee, **$213,180**•••gravel surfacing 6.336 mi. Manitowoc Co., to A. Mankosky, 220 Island St., Kaukauna, **$12,344**•••top soil base gravel surfacing 7.037 mi. Marquette Co., to A. W. Gallagher & Son, 629 Olin Ave., Madison, **$41,178**•••grading, furnishing, placing roadside treatment materials, gravel surfacing 0.096 mi. Sheboygan Co., to W. H. McFadden, 2721 Union St., Madison, **$5,010**•••grading, drainage 6.336 mi. Manitowoc Co., to J. O'Keefe, De Pere, **$57,718**•••6.034 mi. Marquette Co., to Hoffman Constr. Co., Black River Falls, **$66,396**•••5.577 mi. Lincoln Co., to A. Schroeder, Jr., 1011 West Capitol Dr., Milwaukee, **$101,183**•••4.143 mi. Rusk Co., to Peterson Constr. Co., 610 Wesley Temple Bldg., Minneapolis, **$52,756**•••1.031 mi. Grant Co., to P. W. Ryan Sons, 303 South Third St., Janesville, **$24,526**•••grading, draining, gravel surfacing 0.666 mi. Waupaca Co., to A. W. Bousnalh, 516 U. S. Bank Bldg., Kenosha, **$5,443**•••reconstructing deck of viaduct and approaches 0.542 mi. Milwaukee Co., to Bentley Constr. Co., 4022 North Pt. Washington Ave., Milwaukee, **$148,547**••• constructing structures, Manitowoc Co., to C. Appleton & Sons, 1005 Lawe St., Kaukauna, **$31,387.** Grand total $1,268,765. Bids May 8. Rejected bids May 8, crushed stone surfacing 6.173 mi. Lisbon Rd., U. S. Wks. Project WPSS 605-A, WPMS 605-B. Juneau Co.: grading, draining 2.077 mi. Prentice Ashland Rd., Fifield Ashland Co. Line Rd., Price Co.: constructing 226 ft. high truss structures, Wheeler Norton Rd., Dunn Co. Noted May 12, C. D.—May 14, E. N.-R.

N. B., Fredericton—Municipality, constructing 1/6 mi. road from Experimental Station to city limits, day labor. $27,000. J. D. Mackay, city engr., will purchase all materials.

EARTHWORK, IRRIGATION, DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Redwood City—City, election June 11 (extended date), $266,000 bonds (increased amount), to finance deep water port improvements to be matched with federal funds. Noted May 11, C. D.—May 14, E. N.-R.

Conn., Milford—Town, U. S. A., Major M. J. Young, U. S. War Dpt., preliminary plans dredging and widening Housatonic River in town of Milford. $495,000. Federal aid $345,000.

†**Maryland**—U. S. Eng., Baltimore, Md., withdrew bids to have been opened May 11, placing layer of cape stone and building 1 manstone for cape stone on south face of North Jetty, at Ocean City; also dredging in Onacock River. Noted May 4, C. D.—May 7, E. N.-R.

★ **Alta., Edmonton**—Provincial Govt., L. C. Charlesworth, chn. Com., making plans irrigation project, incl. irrigation scheme at Leavitt and Pot Hole Creek, Berry Creek and diversion of Milk River near Warner, also storage dam at Wild Horse. $2,000,000.

BIDS ASKED

Conn., Norwalk—See "Contracts Awarded."

†**Michigan**—U. S. Eng., Milwaukee, Wis., taking bids dredging 48,000 cu.yd. from Grays Reef Passage; adv. E. N.-R., May 21.

†**Mich., Port Huron**—May 28, by U. S. Eng., Detroit, Mich., dredging 16,000 cu.yd. place measurement in Black River, here.

†**New Jersey**—June 5, by U. S. Eng., 2nd Dist., New York, restoring stone jetties and bulkheads, Manasquan River; adv. E. N.-R., May 21.

†**New Mexico**—U. S. Eng., Tucumcari, bids about June 15, constructing Conchas Dam, 220 ft. high, 1,160 ft. long, incl. earth dikes on each side in South Canadian River, ¼ mi. below its confluence with Conchas River, San Miguel Co.

Tex., Palacios—May 29, by Palacios Seawall Comn., c/o G. A. Harrison, chn., seawall extension, vitr. clay or concrete storm sewer. $18,000. P.W.A. project. Southwest Eng. Co., Littlefield Bldg., Austin, engrs. Noted Apr. 30, C. D.—May 7, E. N.-R.

†**Virginia and North Carolina**—June 8, by U. S. Eng., Norfolk, Va., dredging 301,000 cu.yd. material from Southern Branch of Elizabeth River, Va., and from Coinjock Bay Cut, N. C.; adv. E. N.-R., May 21.

Ont., Orangeville—May 30, by F. M. Eagleson, engr., Bythia St., 20,000 cu.yd. excavation, repairs and improvements to Drain 10, 10,316 ft. long and Drain 33, 13,500 ft. long, 20,000 cu.yd. excav., for East Luther Twp. $15,000.

†**Alaska**—June 4, by U. S. Eng., Federal Office Bldg., Seattle, Wash., dredging 78,250 cu.yd. from harbor, Wrangel; 132,215 cu.yd. Petersburgh Harbor.

CONTRACTS AWARDED

†**Calif., Colusa**—U. S. Eng., Post Office, Sacramento, setting back, raising and strengthening existing levee and constructing new levee along east side Sacramento River, between Moulton Weier and ¼ mi. downstream from bridge over Sacramento River, here, to Morrison-Knudsen Co., P. O. Box 1518, Boise, Idaho, $200,831. Bids May 6, awarded May 12. Noted May 12, C. D.

Conn., Hartford—Bd. Contr. & Supply, C. M. Yale, secy., Contr. 1, Clark Dike, incl. 30,000 cu.yd. silt sand, from borrow pit and 14,000 cu.yd. river sand to be placed in dike embankment, to F. H. McGraw & Co., 525 Main St., $17,440. Bids May 5, awarded May 7. Noted May 1, C. D.

Conn., Norwalk — City, drainage work and landscaping on 45 mi. roads. Owner builds. P. Wks. Dpt. **W.P.A.** labor. $45,126. P. James, City Hall, engr.

†**Illinois**—U. S. Eng., 932 Post Office Bldg., Canal and Van Buren Sts., Chicago, dredging in Illinois Waterway Pools, to American Aggregate Corp., Greenville, O., $59,658. Bids Apr. 15. Noted Mar. 12, C. D.—Mar. 19, E. N.-R.

Ia., Adel—Dallas Co. B. F. Pringey, aud., 164,000 cu.yd. end haul and 27,800 cu.yd. side cast excav., to C. G. Blythe & Son, Tama, $27,500. Bids May 8. Noted May 1, C. D.

†**N. Y., Fort Niagara**—Treas. Dpt. at office Sup. Archt., Wash., D. C., sheet pile bulkhead at U. S. Coast Guard Station, to McLain Constr. Co., 162 Sanders Rd., Buffalo. Bids Apr. 29. Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

N. Y., New York—Dpt. Docks, Pier A, Battery Pl., dredging 220,000 cu.yd. in slips south side of Pier 88, north side of Pier 90, North River, to Morris & Cummings Dredging Co., 44 Whitehall St., at 52c. per cu.yd. Total $114,400. Bids Apr. 30. Noted May 1, C. D.

N. Y., New York—J. McKenzie, comr. Docks, Pier A, Battery Pl., dredging at southwest side of Wards Island, Harlem River. Contr. 2119, to Great Lakes Dredge & Dock Co., 17 Battery Pl., $9,525. Bids May 6. Noted May 7, C. D.—Apr. 30, E. N.-R.

†**Tex., Port Aransas**—U. S. Eng., Trust Bldg., Galveston, removing and replacing stone and installing three 36 in. drain pipe fishway culverts through south jetty, to Scrivner & Richardson, Aransas Pass, $6,500 (mostly pipe cost).

B. C., Prince Rupert—Secretary Dpt. P. Wks., Ottawa, Ont., dredging 11,000 cu.yd. Class "B" material, to Armour Salvage & Towing Co. Ltd., Prince Rupert, at 61.5c. per cu.yd.; floating breakwater, to John Currie & Son, Prince Rupert, $9,742. Noted Apr. 16, C. D.—Apr. 23, E. N.-R.

Canada—Dpt. P. Wks., Ottawa, Ont., dredging 15,500 cu.yd. Class "B" material, Port Dover, Ont., to C. S. Boone Dredging & Constr. Co. Ltd., Toronto, Ont., at 39c. per cu.yd.••• wharf repairs, Campbell River, B. C., to Vancouver Pile Driving & Constr. Co. Ltd., Vancouver, B. C., $5,388•••fittings for public building, New Toronto, Ont., and Dunneville, Ont., to Office Specialty Mfg. Co. Ltd., Ottawa, Ont., $3,333 and $1,532 respectively•••fittings for public building, Mission City, B. C., to B. C. Hardwood Floor Co. Ltd., Vancouver, B. C., $1,094.

Ontario — Dpt. P. Wks., Ottawa, dredging 60,000 cu.yd. Class "B" material (sand, silt and mud) mouth Thames River, to A. B. McLean & Sons, Sault Ste Marie, at 23c. per cu.yd., and to Chatham Dredging & General Contg. Co., Ltd., Chatham, at 23c. per cu.yd.

UNCLASSIFIED

PROPOSED WORK

Iowa — TRANSMISSION LINES — Harrison Rural Electrical Co-Operative Assn., Logan, plans constructing 300 mi. rural transmission lines in Logan, Harrison Co. F. H. Seabury, Pisgah, chn.

Mich., Sault Ste. Marie — COMMUNITY BUILDING and SKATING RINK—City, election June 1, $75,000 bonds for community building and skating rink. R. E. Dodd, Sault Ste. Marie, engr.

N. Y., Newburgh—TUNNEL—City, City Hall, plans nearing completion constructing vehicular tunnel under Downing Park. $200,000. E. M. Wilbur, 18 Ferguson Ave., Port Jervis, engr. **Maturity 1936.** Noted June 14, C. D.—June 20, E. N.-R.

N. Y., New York—COMFORT STATION—Dpt. Parks, Arsenal Bldg., Central Park, plans by A. Embury, 2nd., c/o owner, constructing 1 story, 21x42 ft., brick comfort station, Cadwell Ave. and 161st St. Est. about $25,000.

N. Y., Rochester — GAS LINE — Abbot Gas Corp., Olean, N. Y., and G. L. Cable Inc., 77 Franklin St., Boston, Mass., plan constructing 100 mi. 14 in. pipe line from gas fields in southern Allegany Co., north across New York State line to Rochester. To exceed $500,000. Owner's own staff of engineers, Olean, in charge.

North Carolina—RURAL ELECTRIFICATION LINES—State Rural Electrification Authority, D. Bagley, chn., Raleigh, approved project for 16 mi. lines for Glenview Community in Halifax Co. A non-profit electric membership corporation will be set up in Halifax County area to apply for Federal loan to finance project. J. W. Whitaker, Enfield, chn. Bd. Comrs.

North Carolina—RURAL ELECTRIFICATION LINES—Tidewater Power Co., Wilmington, F. A. Matthes, pres., plans 128.5 mi. rural lines in 17 southeastern North Carolina counties. $142,250. Application approved.

★ **Wash., Seattle**—DISTRIBUTION SYSTEM—City Light Dpt., City Light Bldg., council asked for authorization, extensions of distribution system, $500,000. J. D. Ross, City Light Bldg., engr.

★ **Que., Quebec City**—RAILWAY—Temiscaming & Abitibi Ry. Co., Montreal, Que., applies to Provincial Legislature for permission to construct railway from town of Anglers, Temiscaming Co., to Lake Chitsonganan in Lake St., John Dist. $1,000,000.

BIDS ASKED

Ill., Dunlap—TRANSMISSION LINES—See "Contracts Awarded."

Mass., Worcester—FIELD HOUSE—May 26, by City, W. S. Young, supt. Schools, constructing brick, stone athletic field house. Chandler St. Est. $25,000. G. A. Johnson, 16 Norwich St., engr. Noted Dec. 18, C. D.—Dec. 26, E. N.-R.

Mo., St. Louis—BOILER REPAIRS—Bd. Public Service, City Hall, taking bids emergency boiler repair for Div. Light, Heat & Power, for period of one year. $5,500.

New York—TUNNEL VENTILATION BUILDING—June 9, by Port of New York Authority, F. C. Ferguson, chn., 111 8th Ave., New York, constructing New York Land Ventilation Building, for Midtown Hudson Tunnel, Contr. MHT-14, P.W.A. project; adv. E. N.-R., May 21.

New York — TELEPHONE EMERGENCY EQUIPMENT—June 5, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing telephone and emergency alarm equipment, for Independent City-Owned Rapid Transit R.R. from Roosevelt Ave., to 178th St., Queens Boro and Fulton St., to Nassau Ave., Brooklyn Boro, Equipment Contr. No. S-17.

N. Y., Albany—FOOTBALL FIELD, etc.—See "Contracts Awarded."

N. Y., Binghamton and Endicott—AIRPORT—See "Contracts Awarded."

N. Y., Buffalo — PARK — See "Contracts Awarded."

N. Y., Douglaston—COMFORT STATION—See "Contracts Awarded."

N. Y., Elmira—See "Contracts Awarded."

N. Y., Holley — PARK — See "Contracts Awarded."

N. Y., Orchard Park—CASINO—See "Contracts Awarded."

O., Vandalia — AIRPORT — See "Contracts Awarded."

Okla., Altus—OIL PIPE LINE—See "Contracts Awarded."

Okla., Oklahoma City—GAS PIPE LINE—See "Contracts Awarded."

Okla., Oklahoma City—MUD PIPE LINE—See "Contracts Awarded."

Okla., Oklahoma City—OIL PIPE LINE—See "Contracts Awarded."

Washington — RAILROAD — See "Contracts Awarded."

Washington — RAILROAD — Weyerhauser Timber Co., Tacoma Bldg., Tacoma, taking bids grading 10 mi. logging railroad in Lewis Co. east of Spirit Lake, incl. 200,000 cu.yd. excav. W. Ryan, Tacoma Bldg., engr.

Ont., Niagara Falls—DAM—See "Contracts Awarded."

CONTRACTS AWARDED

★ **California**—PIPE LINE—Valley Pipe Line Co., 417 South Hill St., Los Angeles, constructing 10 in. pipe line from Kettleman Hills to Estero Bay, 70 mi. pipe line and terminal facilities, laying and welding pipe, to Lang Transportation Co., 5501 Santa Fe Ave., Vernon. Total est. $1,500,000. The Valley Pipe Line Company is composed of the Texas Co., 929 South Broadway, Los Angeles, and the Seaboard Petroleum Co., 1103 North Date St., Los Angeles, and 417 South Hill St., Los Angeles. Owner and contractor refuses to disclose

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†*Federal Government*

Unclassified (Continued)

amount of contract. Estimated cost includes pipe which has been purchased by owners, terminal facilities and contract for laying and welding. A. J. Patrick, c/o Texas Co., 929 South Broadway, Los Angeles, engr.

Calif., Los Angeles—RAILWAY EXTENSION—A. Eldridge, genl. mgr. Harbor Dpt., City Hall, constructing railroad interlocking plant at East Thenard and West Thenard Sts., Wilmington, to control movements of trains over 6 crossings, incl. construction of concrete tower building for housing local and remote control of switches, signals, etc., frame tool houses, etc., Los Angeles Municipal Terminal R.R. belt line, P.W.A. Docket 1208 Unit, Spec. 947, to Bennett & Taylor, 1046 Venice Blvd., $119,600. Est. $44,880. Bids Feb. 19, awarded May 6. Noted Feb. 26, C.D.—Feb. 6, E.N.-R.

Calif., Los Angeles—SUBWAY—City, Bd. P. Wks., constructing Macy St. Subway, rein.-con., 2 hinge arch type, 68 ft. wide, 50 ft. long, 17 ft. clearance, to Bent Bros. Constr. Co., 418 South Pecan St., $274,378. Est. $368,000. P.W.A. Bids Apr. 8, awarded May 8. Noted Apr. 16, C.D.—Mar. 19, E.N.-R.

Ill., Dunlap—TRANSMISSION LINE—Suburban Electric Corp., Dunlap, constructing 97 mi. transmission lines, by force account, $81,500.

Ill., Jacksonville—DISTRIBUTION SYSTEM—State, Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, 2,400 volt distribution system at Jacksonville State Hospital, to E. A. Koeneman, 1408 Delmar St., St. Louis, Mo., $13,734. Bids Apr. 15. Noted Apr. 10, C.D.

Colo., Hadley—RAILROAD WORK—Atchison, Topeka & Santa Fe R.R. Co., W. W. Kelly, div. engr., Amarillo, Tex., curve reduction work on main line of Santa Fe R.R. near here to Arthur & Allen, 409 North Grand Ave., Pueblo.

Ia., Des Moines—FAIR GROUNDS—Iowa Fair Grounds, altering state fair grounds, to A. H. Neumann & Bros., Inc., East 1st and Des Moines Sts., $44,861, exhibit pens, to Clay Equipment Corp., Cedar Falls, $34,850.

Mass., Roxbury—WADING POOL, etc.—City of Boston, trustees of George Robert White Fund, City Hall Annex, Boston, constructing wading pool, locker building, etc., at Health Unit 7, at Whittier, Downing, Vernon and Hampshire Sts., to A. Singarella, 22A Tremlett St., Dorchester, $40,350. Noted Apr. 24, C.D.—May 6, E.N.-R.

Mo., St. Louis—PARK—Syndicate forming c/o Mauren, Russell & Crowell, archts., Chemical Bldg., recreational facilities, incl. swimming pool, dance hall, restaurant, Hy. 66, and Meramec River in St. Louis Co., to A. D. Gates Contr. Co., 4864 Theodosia Ave.

N. Y., Albany—FOOTBALL FIELD, etc.—City, City Hall, constructing football field and playground at Old Penitentiary site, south side of Myrtle Ave. and west of Lark St., incl. grading, planting, seeding, sidewalks, etc., by relief labor. To exceed $23,000. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, procurement officer W.P.A., will purchase materials.

N. Y., Binghamton and Endicott—AIRPORT—Tri-Cities Airport Comn., P. S. Hopkins, in charge, c/o City of Binghamton, City Hall, Binghamton, developing Class A airport, on 200 acre site (to be purchased at once), near here, incl. regrading 140,000 cu.yd. field, widening, lengthening existing runways to provide three 3,000 ft. runways, constructing dikes along river bank as flood protection, installing lighting facilities, etc., relief labor. $118,000. **W.P.A.** Noted Jan. 30, C.D.—Feb. 6, E.N.-R.

N. Y., Buffalo—PARK—City, City Hall, constructing octagonal casting pool in Rees Park, relief labor. **W.P.A.** $40,000. M. F. Downing, City Hall, will purchase materials.

N. Y., Douglaston—COMFORT STATION—Dpt. Parks, Arsenal Bldg., Central Park, New York, constructing 1 story, brick, 19x50 ft. comfort station, Alley Pond Park, day labor. To exceed $25,000. Owner is purchasing materials. A. Embury, 2nd, c/o owner, archt.

N. Y., Elmira — GLIDING FIELD — Bd. Supervs., Chemung Co., improving gliding field, incl. constructing 5 bunk houses, roads, grading field, etc. $100,000. Owner builds and purchases materials.

N. Y., Holley — PARK — City, M. Downey, street comr., constructing park, incl. filling old Erie Canal Bed, grading, planting, seeding, constructing roads, sidewalks, sewer lines, baseball diamond and recreation facilities, own forces.

★**N. Y., Long Beach**—BOARDWALK, etc.—City Council, City Hall, constructing boardwalk, ramps and comfort station, on ocean front, to Faircroft Eng. Co., 16 Court St., Brooklyn, $682,709. **P.W.A.** Bids Apr. 28. Noted Apr. 30, C.D.

N. Y., Orchard Park—CASINO—Bd. Supervs. Erie Co., Court House, Buffalo, constructing casino in Chestnut Ridge Park, by relief labor, $110,000 or more. **W.P.A.** F. Downing, Buffalo, will purchase materials.

N. Y., Syracuse—RADIO TOWER—J. D. Taylor Constr. Co., general contractors, 119 South Salina St., structural steel for radio station, Valley Dr., for Central New York Broadcasting Co., Syracuse Bldg., to Syracuse Eng. Co., Everson Bldg. Noted May 12, C.D.—May 14, E.N.-R., under "Contracts Awarded."

N. Y., Tonawanda—TRUCKING PLATFORM—Eastern States Milling Corp., Ontario St., trucking platform, to Hydro Constr. Co., Stock Exchange Bldg., Buffalo. Contractor awarded contract for structural steel, to Ernst Iron Wks., 75 Lathrop St., Buffalo. Bids May 1. Noted Mar. 13, C.D.—Mar. 19, E.N.-R., under "Industrial Buildings."

★**O., Vandalia**—AIRPORT—City of Dayton, F. O. Eichelberger, city mgr., constructing 160,000 sq.yd. 7-5-7-in. concrete runways, building repairs, drainage, fencing. **W.P.A.** labor. Est. $700,000. G. F. Baker, Dayton, city engr.

Okla., Altus—OIL PIPE LINE—Gulf Oil Co., Tulsa, 14 mi. 6 in. oil pipe line, by company forces. $75,000. Private plans.

Okla., Oklahoma City—GAS PIPE LINE—Phillips Petroleum Co., Bartlesville, constructing 6,800 lin.ft. 12 in. steel gas pipe line by company forces. $30,000. A. H. Riney, Bartlesville, engr.

Okla., Oklahoma City—GAS PIPE LINE—Skelley Oil Co., Tulsa, constructing 9,500 lin. ft. 8 in. steel gas pipe line on Lindsay Ave., own forces. $28,000. F. Lovell, Tulsa, engr.

Okla., Oklahoma City—MUD PIPE LINE—Dovan Oil Co., Cotton Exchange Bldg., constructing 12,000 ft. 4 in. mud line on Kelley St., own forces. $27,000. E. D. Hill, Insurance Bldg., engr.

Okla., Oklahoma City—OIL PIPE LINE—Anderson-Pritchard Oil Co., Ramsey Bldg., constructing 9,600 ft. 6 in. oil pipe line on 36th St., own forces. $25,000. E. H. Wahl, Ramsey Bldg., engr.

Okla., Oklahoma City—OIL PIPE LINE—Sunray Oil Co., Tulsa, constructing 7,600 lin.ft. 8 in. steel oil pipe line in Stiles Ave., by company forces. $35,000. J. Abernathy, Tulsa, engr.

Okla., Oklahoma City—OIL PIPE LINE—Superior Oil Co., Gulf Bldg., Houston, Tex., constructing 11,000 lin.ft. 8 in. steel pipe line in Kelley Ave., own forces. $30,000. Private plans.

Pa., Phila. — PORTABLE SEATING for STADIUM—City, City Hall Annex, M. J. McLaughlin, dir., portable seating for municipal stadium, to J. R. Farrell, 21 South 46th St., $139,356.

Washington—RAILROAD—Miller Logging Co., Boom Bayside, Everett, rebuilding 9 mi. Old Index-Galena R.R. and constructing extension, temporary quarters, replaced in fall by new structures, company forces. Work just started. $150,000. G. Austin, c/o company, engr.

B. C., Cowichan Bay—WHARF—Canadian National Rys., constructing 40x700 ft., pile and plank assembly wharf with 2 lines of rail trackage, to Thomas H. Bell, 1752 East 11th Ave., Vancouver, $50,000. Awarded Apr. 28.

Ont., Froomefield—DOCKS—Canadian Oil Co., constructing 35 ft. concrete, timber extension to docks, 2 steel storage tanks. Owner builds under supervision A. Hale, supt. Canadian Oil Co., Petrolia. Est. $35,000.

Ont., Niagara Falls—DAM—Canadian Niagara Power Co., constructing power transmission line from Niagara Falls to Fort Erie with transformer station at Ridgeway, own forces. Est. $80,000. Noted Feb. 26, C.D.—Mar. 5, E.N.-R.

MATERIALS AND EQUIPMENT

PROPOSED WORK

DUMP TRUCKS—**Long Beach, Calif.**—R. M. Dorton, city mgr., City Hall, rejected bids Apr. 20, 3 cu.yd. water level capacity dump trucks. Noted Apr. 15, C.D.

STEEL TANK—**St. Louis, Mo.**—Three Flowers Ice Cream Co., 3819-21 Cote Brilliante Ave., applied for permit to install one 500 gal. underground steel tank for gasoline, 3819-21 Cote Brilliante Ave.

TANK — **St. Louis, Mo.** — L. Levin, 1205 Gravois Ave., applied to Bd. Public Service for permit to install two 500 gal. underground steel tanks for filling station, 1205 Gravois Ave.

†DIPPER SHOVELS — **Omaha, Neb.** — U. S. Eng., 819 City Natl. Bank Bldg., soon takes bids two standard 1¼ yd. full Diesel engine driven crawler mounted dipper shovels. $25,000.

STORAGE TANKS—**New York**—Sinclair Refining Co., 10 West 51st St., plans purchasing 1,000 gal. gasoline storage tank for service station in Saratoga Springs and Cortland, etc. To exceed $1,000 each. G. P. Foster, c/o owner, in charge.

TANKS, etc.—**Buffalo, N. Y.**—J. J. Winer, 487 William St., plans installing 500 and 1,000 gal. steel tanks, electrical pump, air compressor, etc. at gasoline service station, 489 William St. To exceed $1,000.

STEEL STORAGE TANK—**Elmira, N. Y.**—Standard Oil Co. of New York, Genesee Bldg., Buffalo, soon purchases 500 or 1,000 gal. steel gasoline storage tank for proposed service station, Washington and Walnut Sts. To exceed $1,000.

MOTOR PUMPER—**Falconer, N. Y.**—Village Bd. Trustees, Community Hall, plans purchasing new motor pumper truck for fire fighting purposes, also plans complete remodeling of heating system in community building. To exceed $1,000. S. T. Benson, village engr.

HOOK and LADDER and EQUIPMENT—**Fredonia, N. Y.**—Village Bd. Trustees, F. Sahle, ch. Fire Dpt., plans purchasing hook and ladder

Federal Government

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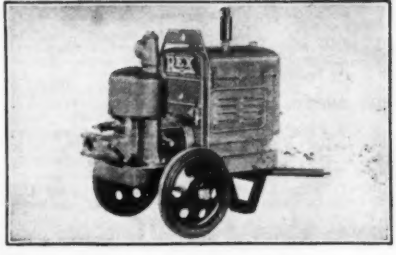

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REX Construction Equipment

Materials, etc. (Continued)

and equipment for Lambert Hook and Ladder Co. $5,000. **Maturity soon.**

STORAGE TANK—**Fredonia, N. Y.**—Lakeshore Petroleum & Fuel Co., Jamestown, soon purchases 1,000 gal. steel gasoline storage tank for gasoline service station, Spring and Main Sts. To exceed $1,000. A. Dickinson, in charge for owners.

TANK—**Jamestown, N. Y.**—A. H. Klim, general contractor, 8 East 5th St., soon purchases 500 or 1,000 gal. steel gasoline tank for service station, at 8 East 5th St., for D. E. Endress Estate, 30 Terrace Pl. To exceed $1,000.

STORAGE TANK—**Johnstown, N. Y.**—Sinclair Refining Co., 10 West 51st St., New York, plans purchasing steel storage tank for proposed gasoline service station. To exceed $1,000. G. Foster, in charge.

STORAGE TANK—**Schenectady, N. Y.**—Sinclair Refining Co., 10 West 51st St., New York, plans purchasing 1,000 gal. steel gasoline tank, for proposed service station. G. Foster, in charge. To exceed $1,000.

TRUCKS—**Canton, O.**—City, R. A. Bauhof, dir. Service, plans purchasing four new trucks for garbage hauling. To exceed $1,000.

ROAD GRADER, etc.—**Oklahoma City, Okla.**—City plans purchasing one 10 ft. road grader and 45 hp. diesel powered crawler type tractor. C. D. Holt, street supt.

STEAM TURBINE GENERATOR SET — **Stillwater, Okla.** — City soon purchases 2,500 kw. steam turbine generator set. $80,000. J. W. McKinnon, Stillwater, engr.

FIRE FIGHTING EQUIPMENT—**Coplay, Pa.**—Coplay Fire Co., Fire Hall, plans purchasing motor pumper truck with booster tank and pump; new fire hose and other fighting equipment. $2,500-$3,500. **Maturity soon.**

STEEL TANKS, etc. — **Phila., Pa.** — J. S. Prairia, Jr., 4508 North Mole St., plans installing 500 gal. steel tanks, electric pump, air compressor, etc., at gasoline service station to be built at Pine and 13th Sts. To exceed $1,000.

STEEL TANKS, etc.—**Williamsport, Pa.**—Wurster Battery & Ignition Co., West 3rd and Walnut Sts., A. H. Wurster, mgr., plans installing 550 gal. steel tanks, electric pump, air compressor and other equipment at super service station to be established at portion of above address. To exceed $1,000.

MOTOR EQUIPMENT—**Norfolk, Va.**—City plans expending $9,350 for motor equipment for Street Cleaning Dpt. City Water Dpt. in charge of sales arrangements.

PUMPING EQUIPMENT, etc.—**Norfolk, Va.**—City plans new pumping equipment and repairing pumping stations. $6,000. City Water Dpt. in charge of sales arrangements.

ROAD OIL — **Menasha, Wis.** — City rejected bids May 5, 50,000 gal. road oil. Will readvertise. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

STREET SWEEPER—**Victoria, B. C.**—Municipality, A. W. Lune, chn. P. Wks. Comn., interested in prices of machine street sweeper. $8,365 available.

STREET FLUSHER — **St. Thomas, Ont.** — Council, W. C. Miller, city engr., plans purchasing street flusher. Interested in prices and information.

PUBLIC SCALE—**Joliette, Que.**—Municipality wants prices for purchasing public scale. $30,000. E. H. Lippe, City Hall, engr.

BIDS ASKED

ROCK and SCREENINGS, etc.—**Berkeley, Calif.**—City, F. Turner, clk., taking bids furnishing rock and screenings and electric lamps. To exceed $2,000.

ROAD OIL—**Lakeport, Calif.**—June 1, by D. W. Dillard, city clk., road oil. To exceed $2,500.

ROAD GRADER—**Stockton, Calif.**—City, B. L. Trahern, clk., taking bids furnishing motor-driven road grader.

ROAD GRAVEL—**Stockton, Calif.**—City, taking bids furnishing 4,300 tons cementic road gravel.

LABORATORY SUPPLIES, etc.—**South Windsor, Conn.** — Town, School Com., taking bids furnishing general school equipment, incl. laboratory, home economics, gymnasium equipment, water pumps and tanks, air pump, steel lockers, bleachers, oil burners with tanks. W. T. Marchant, 36 Pearl St., Hartford, engr.

†FITTINGS, etc.—**Wash., D. C.**—May 25, at office General Purchasing Officer, Wash., D. C., fittings, gate valves, machine bolts, barrel bolts, globe valves, check valves, wrought iron pipe, etc., Schedule 3145.

PAINT—**Florida**—May 29, by State Rd. Dpt., Tallahassee, furnishing paint requirements for one year.

TRAFFIC SIGNAL CONTROL EQUIPMENT —**Chicago, Ill.**—May 26, by Dpt. Streets & Electricity, City Hall, furnishing, delivering traffic signal control equipment in pre-timed fixed cycle type, various kinds and amounts, to storeroom of Dpt. Streets & Electricity, 405 West Chicago Ave. O. E. Hewitt, city engr.

TRUCK CHASSIS—**Winona, Minn.**—May 27, by City, one fore truck chassis. E. E. Chadwick, city engr.

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†TIMBER, etc.—**Vicksburg, Miss.**—June 8, by U. S. Eng., P. O. Box 667, Vicksburg, 5,600 ft. B. M. structural stock, hill red or white oak lumber with no box heart; also 4 portable self priming drainage pumps.

†VALVE FRAME, etc.—**Vicksburg, Miss.**—June 11, by U. S. Eng., Box 667, Vicksburg, butterfly valve frames, operating stands for valve, shaft coupling flanges, hand wheels, f.o.b. Monroe, La.

†WELDING MACHINE—**Vicksburg, Miss.**—June 2, by U. S. Eng., 1 heavy duty 300 ampere gasoline engine driven portable truck type electric welding machine, f.o.b. Greenville.

CEMENT—**Binghamton, N. Y.**—A. A. Calabrisi, State Procurement Officer for Works Progress Administration, Telephone Bldg., Binghamton, taking bids cement, dynamite and corrugated metal pipe for various W.P.A. projects, near here.

TRUCK—**Dansville, N. Y.**—Village, Village Hall, taking bids large truck for Dpt. P. Wks. To exceed $1,000.

SEPTIC TANKS—**Irvington, N. Y.**—Erard Matthiessen, Tiffany Park, Irvington, taking bids purchasing several septic tanks for sewerage in residential development on Cyrus Field Rd. Will purchase when Village Bd. Trustees permits use of septic tanks. Question has arisen to proximity of village reservoir. To exceed $1,000.

STEEL GASOLINE TANK—**Rochester, N. Y.**—Hambleton Terminal Corp., 46 Skillen St., Buffalo, taking bids 500 or 1,000 gal. steel gasoline storage tank for service station at Smith and State Sts. To exceed $1,000.

STEEL GASOLINE STORAGE TANK — **Seneca Falls, N. Y.**—Standard Oil Co. of New York, Genesee Bldg., Buffalo, H. M. Graves, in charge, will purchase 1,000 gal. steel storage tank for gasoline service station, Fall and Rumsey Sts.

STEEL PIPE, etc.—**Westfield, N. Y.**—S. R. Ross, Greystone Lodge, bids about June 1, 1,900-2,100 ft. 6¼ in. steel pipe, collars, etc. $2,000. Noted Mar. 19. C. D.—Mar. 26, E. N.-R.

SLAG—**Cleveland, O.**—May 29, by Bd. Comrs. Cuyahoga Co., 1,000 tons No. 46 slag.

SPRAY TANKS—**Cleveland, O.**—May 26, by Bd. Comrs. Cuyahoga Co., two 800 gal. Littleford 101 or equal utility spray tanks. $3,400.

TRUCKS — **Cleveland, O.** — May 26, by Bd. Comrs. Cuyahoga Co., six 3-4½ ton Model 718 white or equal trucks. $18,000.

†CONCRETE, **Oklahoma City, Okla.**—June 8, by P. Wks. Administration, Housing Div., 310 Key Bldg., Oklahoma City., 5,000 cu.yd. ready mixed concrete for street paving work on housing project. $35,000.

BITUMINOUS ASPHALT, etc.—**Canton, Pa.**—May 25, by Borough Council, Borough Hall, 72,000 gal. bituminous asphalt dressing and 807 tons limestone chips. To exceed $1,000.

ROAD ROLLER — **Clarion, Pa.** — Borough Council, Borough Hall, taking bids for rental with option to purchase after 8 months new road roller. To exceed $1,000. C. Russell, chn. of committee in charge.

DUMP TRUCK, etc.—**West York, Pa.**—June 1, by R. Kraber, boro secy., 1½ ton dump truck, crushed stone for street repairs as required, asphalt road oil as required. C. S. Davidson, 41 North George St., boro engr.

DUMP TRUCKS—**Wilkes-Barre, Pa.**—May 26, by Comrs. Luzerne Co., six 1½ ton dump trucks, one 10 ton road roller and one motor grader. To exceed $1,000. W. W. Multer, Wilkes-Barre, co. controller.

PUMPING EQUIPMENT—**Wilkes-Barre, Pa.**—Davis Millwork Co., 1166 Murray St., taking bids furnishing belt or motor driven deep well water pumps and equipment. $1,000.

CRACK FILLER, etc.—**Fond du Lac, Wis.**—May 29, by City, one car each of crack filler, road oil, cold patch, sand and gravel — year's supply.

TURBO-GENERATOR, etc.—**Richland Center, Wis.**—June 2, by Common Council, at office City Clerk, one 1,000 kw. condensing turbo-generator unit, surface condenser, pumps and auxiliaries, 8 switchgear units, electrical cable lengths, 1 convection type superheater for present 400 hp. Vogt boiler, 1 boiler feed pump, piping for superheater, condenser and turbine. $70,000. H. C. Carroll, Commercial Testing & Eng. Co., 360 North Michigan Ave., Chicago, Ill., consult. engr.

ROAD MAINTAINER—**Orangeville, Ont.**—J. H. Beatty, engr., Orangeville, in market for power road maintainer for Dufferin Co. $4,000. Oliver Durkin, R.R. 1, Waldemar, chn. Good Roads Com.

ROAD OIL, etc.—**St. Thomas, Ont.**—W. C. Miller, city engr., in market for 3 tank carloads of road oil, 1 car refined tar, 4 cars of cold process asphaltic patching material.

BOILER, etc.—**Montreal, Que.**—H. V. Bernier, 4874 Park Ave., in market for one 100 hp. locomotive or scotch marine boiler for 100 lb. working pressure and one 50 or 75 hp. steam engine.

STEEL TANKS, etc.—**Quebec City, Que.**—Alfred Duclos, 36 St. Sawview St., in market for two 500 gal. steel gasoline tanks, 1 double gasoline pump.

TANKS, etc.—**Quebec City, Que.**—Champlain Oil Products Ltd., Demers St., in market for four 5,000 gal. gasoline steel tanks and 2 double gasoline pumps.

CONTRACTS AWARDED

†BRIDGE STEEL—**Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., furnishing steel fully fabricated, 12 tons S. P. R. I. Duarte Branch, 9 tons for Grand Ave. Bridge, 12½ tons for Marshall St. Bridge, 21¼ tons for Hellman Ave. Bridge, 27 tons, for Saxon St. Bridge and 280 tons for Pacific Electric Railway Bridge, Inglewood Line, to Consolidated Steel Corp., 6500 East Slauson Ave., Los Angeles. $51,495. Bids May 7. Noted May 15, C. D.

†CLAMPS, etc.—**Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., furnishing 5,700 sets form clamps without tie rods for 1 in. sheathing, 4 in. studs and 4 in. walls and 3,300 same for 1 in. sheathing, 4 in. studs and 6 in. walls, to Crellin Machine Wks., 1221 Helvetia St., $6,750•••9,000 cones, steel, extra, to Garlinghouse Bros., 2416 East 16th St. $990••• 6,000 each washers, steel, ¼ in. thick, 11/16 in. hole, 2 3/16 in O. D., to Coast Eng. & Equipment Co., 2060 Santa Fe Ave., $65. Grand total $7,805. Bids Apr. 27. Noted Apr. 24, C. D.

CONDUIT—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing 40,000 ft. 5 in. I. D. straight fiber conduit, Spec. 1942, to General Electric Supply Co., 385 East 2nd St., $6,800. Bids May 1, awarded May 7. Noted May 6, C. D.

DISCONNECTING SWITCHES—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water and Power, 207 South Bway., two ea. 34.5 KVA 600 Amp., 3 pole disconnecting switches, Spec 1897, to Bowie Switch Co., 19th and Tennessee Sts., San Francisco. $1,812. Bids Apr. 17, awarded May 7. Noted Apr. 10, C. D.

†EXPANSION JOINT MATERIAL — **Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., 90,000 sq. ft. expansion joint material, Proposal 612, to J. W. Lytle, 136 North Huntington Dr., Pasadena, $2,745. Bids Apr. 28. Noted May 11, C. D.

MANHOLE COVERS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., furnishing 75 ea. cast steel round outer manhole covers, 90 ea. c.i. manhole inner covers, 75 ea. c.i. manhole frames, Spec. 1943, to Apex Steel Corp., H. S. Hitchcock, receiver, 6147 South Eastern Ave., $4,628. Bids Apr. 28, awarde dMay 7. Noted May 7, C. D.

OIL CIRCUIT BREAKERS — **Los Angeles, Calif.**—D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Broadway, two each outdoor type triple poles, single throw 750,000 KVA oil circuit breakers, Spec. 1926, to Kelman Electric & Mfg. Co., 1650 Naud St., $6,650. Bids Apr. 21. Noted Apr. 28, C. D.

PULLEYS, etc.—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Broadway, furnishing 500 pulleys, Spec. 1922, to Link-Belt Co., 365 South Anderson St., $6,350. Bids Apr. 20, awarded May 7. Rejected bids Apr. 20, furnishing 3,500 Rockwood or equal and 3,500 Browning or equal type pulleys, Spec. 1922. Noted Apr. 28, C. D.

†TRACTORS—**Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., 2 diesel tractors with angle dozer, 94 hp. f.o.b. cars, contractors plant, Proposal 626, to Shepherd Tractor Equipment Co., 150 West Jefferson St., $8,219. Bids May 4. Awarded May 11. Noted May 1, C. D.

COPPER SULPHATE—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512—16th St., 20 tons copper sulphate, Proposal 734, to Federated Metals Corp., 75 Folsom St., $1,500. Noted May 1, C. D.

STEEL STORAGE TANK—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipality, furnishing, erecting 250,000 gal. steel storage tank, Spec. L8-169, to Berkeley Steel Constr. Co., 2nd and Camelia Sts., Berkeley, $3,450. Bids Apr. 22. Noted May 1, C. D.

RAILWAY TRACK MATERIAL—**San Francisco, Calif.**—T. A. Brooks, city purch. agt., City Hall furnishing railway track material for Municipal Railway, Bid 1522, to Bethlehem Steel Corp., 20th and Illinois Sts., $19,465. Bids Mar. 30, awarded May 4. Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

FIRE PUMPER — **Bristol, Conn.** — City, W. Kenneth Sessions, comr. Fire Bd., fire pumper for School St. Station, to La France Fire Engine Co., Holyoke, Mass., $8,000. Noted Jan. 9, C. D.—Jan. 16, E. N.-R.

WHITE ZONE PAINT—**Springfield, Ill.**—Div. Purchase & Supplies, Springfield, 3,250 gal. white zone paint, M 85-36, to Celucoat Products, Inc., 6161 Maple St., St. Louis, Mo., $4,095; 3,250 gal. M 7-36, to Certainteed Products Corp., 1351 North 11th St., St. Louis, Mo., $8,654. Bids Mar. 23, awarded Apr. 3. Noted Mar. 17, C. D.

AIR CHAMBER JOINTS, etc.—**Vandalia, Ill.**—State, Capitol Bldg., Springfield, 344 all metallic air chamber joints and 650 sealed metal joints, all 10 ft. lengths, to Truscon Steel Co., 201 North Wells St., Chicago, $5,920. Bids Apr. 8, awarded Apr. 25.

FIR LUMBER, etc.—**Pocahontas, Ia.**—Pocahontas Co., 46,567 ft. Douglas fir lumber and 2,400 lin.ft. red cedar piling, to Wheeler Lumber, Bridge & Supply Co., 606 Hubbell Bldg., Des Moines, $3,046•••6,500 lin.ft. concrete culvert pipe, to Wilson Concrete Co., Humboldt, $5,439. Bids May 5. Noted May 1, C. D.

PIPE FITTINGS—**Baltimore, Md.**—City, Municipal Bldg., furnishing, delivering brass service pipe fittings, to Bureau Water Supply, to A.

Materials, etc. (Continued)

P. Smith Co., East Orange, N. J., $9,956. Bids May 6.

COMBUSTION CONTROL EQUIPMENT — **Holyoke, Mass.**—Holyoke Water Power Co., 1 Canal St., furnishing combustion control equipment, water level regulators, etc., in connection with power plant, to Republic Flow Meters Co., 201 Devonshire St., Boston. Noted Mar. 5, C. D.

AIR COMPRESSOR — **Minneapolis, Minn.** — City, two air compressors for Sewer Dpt., to W. H. Ziegler Co., 2331 University Ave. S.E., $2,569 each. Noted May 1, C. D.

TRUCK-TRACTOR—**Minneapolis, Minn.**—City, one truck-tractor for Fire Dpt., to P. Pirsch & Sons, Kenosha, Wis., $6,850. Noted Apr. 23, C. D.

GRADER, etc.—**West St. Paul, Minn.**—City, one motor grader, to Austin Western Road Mchy. Co., 2328 Territorial Rd., St. Paul, $4,799; 500 bbl. cement, to United Materials Co., South St. Paul, $2.85 per bbl., less 10% discount if paid within 30 days. Noted Apr. 1, C. D.

†ANNEALED STRAND—**Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., 210,000 ft. ¼ in. galvanized annealed strand, to Williamsport Wire Rope Co., 174 Campbell St., Williamsport, Pa., $3,072. Bids May 8, awarded May 8.

†STEEL SHEETS, etc.—**Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exchange Bldg., steel sheets, bars, angles and plates, to Beck & Corbitt Co., 1st and Ashley Sts., St. Louis, $1,266. Est. $1,500. Bids May 29, awarded May 5. Noted May 8, C.D.—Apr. 23, E.N.-R.

FINE CHATS, etc.—**St. Louis, Mo.**—City, c/o V. P. Roach, supply comr., City Hall, 20,000 tons coarse and 5,000 tons fine chats, to McDonald & Co., 629 Victoria Bldg., at $1.04 per ton, f.o.b. railroad siding; 7,500 tons binder stone, to R. Hencke, 915 Olive St., $1.24 per ton, delivered by truck. Bids Apr. 9.

ROAD OIL—**St. Louis, Mo.**—City, 100,000 gal. more or less road oil for use at St. Louis Municipal Airport at Bridgeton, to Rock Hill Asphalt & Constr. Co., Ladue Rd., 6.98c. per gal. applied. Bids Apr. 23. Noted Apr. 21, C. D.

WIRE ROPE — **Newton, N. J.** — Sussex Co., 40,000 ft. wire rope for guard rails in county, to Ross Young & Dilts, 203 East State St., Trenton, $1,764.

ASPHALTIC OIL.—**Trenton, N. J.**—Mercer Co., 57,400 gal. asphaltic oil, to Barrett Paving Co., 28 West State St., $3,548. Bids May 5. Noted Apr. 27, C. D.—May 7, E. N.-R.

FILTER ALUM—**Trenton, N. J.**—City Manager and Council, 300 tons standard ground filter alum for waterworks, to R. J. S. Barlow, 23 LaSalle Ave.•••to H. N. Richards Co., 1203 East State St.•••to General Supply & Chemical Co., 28 Wolverton Ave.•••to H. M. Royal, Inc., 689 Pennington Ave.•••to R. E. Carroll Inc., Broad St. Bank Bldg.•••and to American Oil & Supply Co., 289 North Willow St., at $1.44 per 100 lbs. Bids May 12.

ROAD ROLLER—**Trenton, N. J.**—P. Morton, city mgr., and Council, road roller for P. Wks. Dpt., to Service Supply Co., 20th and Venango Sts., Phila., Pa. $4,048. Noted May 8, C. D.—May 14, E. N.-R.

CRUSHED STONE—**Albany, N. Y.**—Dpt. P. Wks., Albany, 400 tons No. 1A crushed stone for Hy. 1016, near Moravia, Cayuga Co., to General Crushed Stone Co., 411 Union Bldg., Syracuse, $2.13 per ton, total $852•••300 tons same for delivery to Hy. 995, near Trutxon, Cortland Co., and 4,500 tons same delivered to Hy. 8429 near Apulia, Cortland Co., to Solvay Sales Corp., Box 271, Syracuse, at $2.04 and $1.94 per ton respectively, total $612 and $783 respectively. Grand total $2,337. Bids late in April, awarded about May 5.

BACKGROUND and NUMERAL ENAMELS, etc.—**Raleigh, N. C.**—Division Purchase & Contract, A. S. Brower, dir., to Sherwin-Williams Co., Phila., Pa., furnishing 2,500 gal. black background and 1,250 lb. orange-eggshell finish numeral enamel for automobile registration plates, $1,525•••to Georgia Creosoting Co., Brunswick, Ga., 14,866 bd. ft. creosoted timber, f.o.b. Reidsville, $982; 14,866 bd. ft. f.o.b. Winston-Salem, $964; 14,866 bd. ft. f.o.b. Battleground, $978; 13,900 bd. ft. f.o.b. Tarboro, $904; 13,900 bd. ft. f.o.b. Troutman, $878•••to Dillon Supply Co., 216 South West St., 6,000 lin.ft. round wire rope, 300 galvanized cable clamps, $1,389; nine hundred and fifty-six 20 ft. miscellaneous steel bars, $1,850 •••to Roanoke Iron & Bridge Wks., Roanoke, Va., 280 pairs steel bunks for Central Prison, Unit 7, $3,500•••to Colonial Oil Co., Inc., Norfolk, Va., 425 steel drums grade A, B, C, and D, $1,280•••to American Hardware & Equipment Co., 217 West 1st St., Charlotte, 550 kegs common wire, 50 kegs 8 in. spikes, $1,634 •••to Williamsport Wire Rope Co., 1300 Broad St., Chattanooga, Tenn., 775 ft. coils round wire rope, hoisting rope and cable clamps, $535••• to Salem Steel Co., Inc., Winston-Salem, 42,750 lb. structural steel $1,339•••to Gulf States Creosoting Co., Piedmont Bldg., Charlotte, 50 creosoted timber piles, f.o.b. Winston-Salem, $563; 50 f.o.b. Reidsville, $563; 50 f.o.b. Elizabeth City, $481; 50 f.o.b. Troutman, $481; 50 f.o.b. Prison Camp Siding, Newton, $481; 50 f.o.b. Concord, $481; 50 f.o.b. Tarboro, $481. Grand total $21,289. Bids May 7. Noted May 4 and 5, C. D.

†Federal Government

BITUMINOUS CONCRETE—**Cincinnati, O.**—City, 300 tons bituminous concrete, to Byrnes-Conway Co., 19 Bank St., $1,440. Awarded May 6.

BITUMINOUS MATERIAL — **Pennsylvania** — Commonwealth of Pennsylvania, Harrisburg, furnishing bituminous material, 325 tons, to General Crushed Stone Co., Fidelity Bldg., Phila., $1,911; 915 tons, to C. F. Goeringer, Wilkes-Barre, $5,193. Bids Mar. 20.

BITUMINOUS MATERIAL—**Pennsylvania**—Commonwealth of Pennsylvania, Harrisburg, furnishing bituminous material, 390 tons, to Interstate Amiesite Co., Phila., $2,176•••250 tons, to Amiesite Corp., Emerson Bldg., Phila., $1,500 •••150 tons, to Burrell Constr. & Supply Co., New Kensington, $843. Grand total $4,519.

BITUMINOUS MATERIAL—**Pennsylvania**—Commonwealth of Pennsylvania, Harrisburg, furnishing bituminous material, 600 tons, to Interstate Amiesite Corp., Phila., $3,586•••800 tons, to Barrett Co., 36th St. and Grays Ferry Ave., Phila., $4,222. Bids Mar. 17.

ROAD ROLLER, etc.—**Nanticoke, Pa.**—City Council, furnishing 10 ton road roller and scarifier also power grader to Standard Equipment Co., Wilkes-Barre, $4,820 and $2,943 respectively. Bids Apr. 28, awarded May 8. Noted Apr. 24, C. D.

ELEVATING GRADER—**Aberdeen, S. D.**—Brown Co., one elevating grader, to Austin Western Road Mchy. Co., Aurora, Ill., $3,395. Bids Apr. 7. Noted Mar. 26, C.D.

PIPE, etc.—**Poulsbo, Wash.**—City, City Hall, 550 ft. 2 in. galvanized iron pipe, one 4 in. Corey hydrant, one 4 in. gate valve, twelve ¾ in. corporation cocks for iron pipe, one 4x2 in. reducer threaded for two in. pipe, one 4 in. tee, one 4x4x2 in. tee threaded for two in. pipe, braided hemp and mineral lead for above joints, to Reliable Hardware Co., Poulsbo, $1,270. Bids May 7, awarded May 7.

PIPE—**Renton, Wash.**—City Water Dpt., City Hall, 850 ft. Class B 14 in. c.i. pipe, 12 ft. lengths and one 14x16 in. T length, to American Cast Iron Pipe Co., Sharon Bldg., San Francisco, Calif., $1,832.

WELDED PIPE—**Seattle, Wash.**—City Water Dpt., County-City Bldg., 7,936 ft. 22 in. electrically welded pipe, to Puget Sound Mchy. Depot, 322 1st Ave. S., $40.076•••7,300 ft. 8 in. c.i. pipe, to American Cast Iron Pipe Co., Sharon Bldg., San Francisco, Calif., $7,592••• gate valves, to Pacific Waterworks Supply, Atlantic St. Dock, $1,907, all above material for East Marginal Way watermain. Grand total $49,975. Bids May 5. T. R. Beeman, County-City Bldg., engr.

OILED ROCK—**Walla Walla, Wash.**—Walla Walla Co., 12,000 cu.yd. oiled rock, to Jones-Scott Co., 10 North Third St., $13,200. Bids May 11. J. R. Smith, Walla Walla, engr.

†GRADING MACHINES, etc. — **Milwaukee, Wis.**—U. S. Forest Service, 16 grading machines, to Owensboro Planing Mills, Owensboro, Ky., $674•••1,980 lb. manilla rope, to John Rouschenberger Co., 423 North Plankington Ave., $320•••7,000 ft. high pressure hose, to Goodyear Tire & Rubber Co., 118 South 2nd St., $1,876•••pipe and fittings, to Ellsworth Pipe & Supply Co., 1739 West St. Paul Ave., $794 •••overhead irrigation lines and hangers and couplings, to White Showers, Inc., 6451 Dubois St., Detroit, Mich., $1,400 and $195 respectively•••1,000 one gal. cans, to Adams Schipper, Bay City, Mich., $559. Grand total $5,818. Awarded May 7.

†HOSE COUPLINGS, etc.—**Milwaukee, Wis.**—U. S. Forest Service, F. H. Carroll, purch. agt., hose couplings, to Brass Mfg. Co., Elkhart, Ind., $617•••24 spray guns, to John Bean Mfg. Co., Lansing, Mich., $310•••20 sprayers, to E. C. Brown Co., 845 Maple St., Rochester, N. Y., $99•••1,125 gal. linseed oil, to Badger Paint & Hardware Stores, 5001 West State St., $750•••explosives, to Atlas Powder Co., Houghton, Mich., $31,432•••124 oscillators and 1,200 spray nozzles, to March Auto Irrigation Co., Muskegon, Mich., $1,630 and $18 respectively •••couplings, to White Showers, Inc., 5451 Dubois St., Detroit, Mich., $60•••2 rock crusher plants, to Universal Crusher Co., 625 C Ave. N.W., Cedar Rapids, Ia., $2,317•••pumping units, to Yeomans Bros. Co., 1433 North Dayton St., Chicago, Ill., $853•••grader blades, to Standard Salt & Cement Co., 243 Lake Ave. S., Duluth, Minn., $358•••4 grader blades to Cunningham-Ortmayer Co., 429 West Michigan Ave., $34•••6 gasoline pumps, to Milwaukee Pump & Tank Wks., Inc., 714 East Nash St., $428 •••500 rolls snow fence, to Illinois Wire & Mfg. Co., Joliet, Ill., $1,039•••32 current meters, to David White Co., Inc., 315 West Court St., $2,123. Grand total $42,068. Awarded May 4.

†PAINT, etc.—**Milwaukee, Wis.**—U. S. Forest Service, F. H. Carroll, purch. agt., paint, to DeVoe & Reynolds Co., Inc., 1 West 47th St., New York, N. Y., $253•••lookout towers, to Aermotor Co., 2500 West Roosevelt Rd., Chicago, Ill., $3,905•••saw mill and edger, to R. R. Howell & Co., Malcolm Ave. S.E. and 4th St., Minneapolis, Minn., $591 and $221 respectively•••planer, to Corley Mfg. Co., Clifton Hills, Chattanooga, Tenn., $378•••waterless toilets, to F. R. Dengel Co., 1134 North 4th St., $350•••overhead irrigation lines, to Skinner Irrigation Co., Troy, O., $1,555. Grand total $7,253. Awarded May 11.

TRACTOR, etc.—**Racine, Wis.**—Racine Co., furnishing tractor and 2 scrapers, to Badger Road Equipment Co., 321 North 25th St., Milwaukee, $3,448 and $1,075 respectively. Bids Apr. 29. Noted Apr. 24, C. D.

TRACTOR — **South Milwaukee, Wis.** — City, tractor, to Milwaukee Power Equip. Co., 525 North 22nd St., Milwaukee, $1,685. Bids May 11, awarded May 13. Noted May 8, C. D.

SWITCHING EQUIPMENT—**Winnipeg, Man.**—City, G. F. Bentley, clk., supplying erecting switching equipment for No. 4 substation, to Canadian Westinghouse Co. Ltd., Winnipeg, $13,630.

GASOLINE ROAD GRADER—**Gorrie, Ont.**—Howick Twp., R. G. Edgard, supt., supplying gasoline road grader, to Sawyer-Massey Ltd., Willington St. E., Hamilton, $3,250. Noted Apr. 24, C. D.

FOREIGN

Argentina—Oct. 20, by Direcion General de Construccion de Elevadores de Grano, Buenos Aires, constructing 1st group of terminal and local elevators at Buenos Aires, Bahia Blanca, Quequen, Rosario North and South, and Villa Constitucion, 32,000,000 pesos. Four year program includes 51 terminal and 321 local elevators. Total cost 105,000,000 Argentine paper pesos. Noted Feb. 11, 1935, C. D.—Feb. 21, 1935, E. N.-R.

China, Hong Kong — Blackmore, Basto & Shank Ltd., P. O. Box 8, Hong Kong, in market for hydraulic equipment for 6,000,000 cu.yd. reclamation project, site approximately 1¼ mi. from sea, maximum elevation 320 ft., soil is disintegrated granite weighing about 90 lb. to cubic foot.

England—Integral Auxiliary Engineering Ltd., **London**, preparing plans plant for manufacturing aeroplanes, T. P. Searight, 69 Piccadilly, mgr.•••Tyne Improvement Commission, **Jarrow**, making plans constructing deep water quays $6,750,000•••Portsmouth Steel Co. Ltd., **Portsmouth**, in market for plate framed punching and shearing machine to shear ¾ in. punch ¾ in. through ¾ in. to be fitted with angle and tee cropper to take up 3x3 in.•••**Slough** Municipality awards contract constructing 454 houses, to Manor Park Constr. Co. Ltd., Slough, $992,120 •••Cooper Sheets Ltd., **Cantley**, preparing plans new plant•••**Brighton** Municipality plans by Borough Surveyor, 344 houses $690,000•••**Howden** Rural District, open for tenders for supplying and laying cast iron spun iron pipes, cast iron specials, etc., and accessories, and 32 mi. 3- to 6-in. specials and accessories excavation and constructing 75,000 gal. rein.-con. reservoir••• Fischer Berry Co., subsidiary of Kugel-Fischer of Schweinfiert, Germany, plans factory to manufacture precision balls, bearings, etc., in **Wolverhampton.**

Holland, Amsterdam — N. V. Noord, Hollandsche, Asbestfabriek, c/o I. de Boerr Co., Cruquisweg 118, in market for considerable quantity of insulating materials. Quotations to be c.i.f. Rotterdam.

India, Calcutta—July 17, by Bhaskar Mukergi, secy., Centre Municipality Offices, supplying and installing modern incinerator plant. Prices quoted to hold good for 3 months.

New Zealand, Wellington—Dyes & Chemicals Ltd., P. O. Box 1486, in market for supplying bare stranded copper wire, tinned and enamelled, seven strands, .029 in. c.i.f. New Zealand and packed in 100 ft. lengths and in seven 14 and 28 lb. coils. Samples should be sent.

Scotland — Kilmarnock Municipality making plans 360 houses $710,000•••**Hamilton** Municipality making plans 1,000 houses $1,750,000 •••British Ropes Ltd., **Leith**, preparing plans for new manufacturing plant, $500,000•••**Dunbarton** Municipality making plans 200 houses $465,000.

South Africa—Refrigerators Ltd., Post Office Box 767, **Johannesburg**, in market for supplying dehydrated and deoxidized seamless soft copper tubing for electrical refrigeration, 40,000 ft. in first shipment. References given—Gillespie & Co., 96 Wall St., New York City •••A. G. Blaikie & Co. Ltd., **Purban**, open for supply of wall boards for general building purposes

PUBLIC BUILDINGS

PROPOSED WORK

★ **Calif., Los Angeles**—Los Angeles Co., defeated bonds for county building and 11 branch offices $4,055,000 to be supplemented by PWA funds and construction of new unit for Olive View Sanatarium, $1,760,000. Noted Apr. 9, C. D.—Apr. 16, E. N.-R.

Calif., San Mateo—San Mateo Junior College and High School Dist., plans by G. W. Kelham, 315 Montgomery St., San Francisco, Class "A" concrete Junior High School, $150,000 or more.

Calif., San Francisco—Bay Exposition, Inc., through W. P. Day, dir. of works of exposition, announces appointment of engineers for 1939 World's Fair organization as follows: chief mechanical engineer, W. E. Leland, 58 Sutter St.; chief electrical engineer, E. F. English, 1201 Greenwich St.; chief water supply and sanitary engineer, C. H. Lee, 58 Sutter St.; chief specification writer, A. J. Evers, 525 Market St. Noted Apr. 17, C. D.—Apr. 23, E. N.-R.

★ **†Calif., San Pedro**—U. S. Public Health Service, Constitution Ave., Wash., D. C., making plans constructing general hospital, quarters for officers, homes, heating facilities, kitchens, laundries, power plant, etc. $2,000,000.

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Public Buildings (Continued)

★ **†Calif., San Pedro**—U. S. Department Justice, c/o Treas. Dpt., Wash., D. C., soon takes bids constructing new federal prison, on Reservation Point. $5,000,000-$7,000,000.

†Ga., Fort Benning—Con. Q.M. soon takes bids constructing schools, barracks for bakers and cooks, $140,000; non-commissioned officers' quarters, $16,600; reproduction building, $66,500; water system addition, $105,000. Total $327,000.

Kan., Iola—City final plans in progress and takes bids about May 15, light plant improvement, new power house, new power steam generating unit and turbine. $225,000. Paulette & Wilson, 311 Farmers Reserve Bank Bldg., Salina, engrs. Noted Apr. 17, C. D.—Apr. 23, E. N.-R.

Kan., Kansas City—City making plans new brick, steel, rein.-con. power building at Quindaro plant (waterworks). $200,000. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., engrs.

Kan., Ottawa—Bd. Educ. for School Dist., indefinitely postponed construction pending allocation of P.W.A. funds for 2 rein.-con., brick school additions. $200,000. Washburn & Stookey, Ottawa, archts. Noted Oct. 15, C. D.—Oct. 17, E. N.-R.

†Md., Camp Holabird—Con. Q.M., plans constructing barracks, officers' quarters, sewerage disposal plant, etc. **Muturity in fall.**

Md., Hagerstown—Bd. Educ., Washington Co., making plans new schools at Sharpsburg, Mangansville and additions to Sandy Hook School and Mt. Lena School.

†Md., Upper Marlboro—Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids Mar. 27, constructing U. S. Post Office. $70,000. Will readvertise. Noted Apr. 1, C. D.—Mar. 12, E. N.-R.

Massachusetts—See "Waterworks."

Mo., St. Louis—City, Bd. P. Service, City Hall, soon takes bids constructing superstructure for 2 story, basement, rein.-con., brick, stone community center for negroes, Compton Ave. and Market St. $150,000. P.W.A. project. A. Osburg, City Hall, archt. W. C. E. Beck, city engr.

Neb., Omaha—Negotiations now being pushed by J. B. Fradenburg, atty., 650 Omaha Natl. Bank Bldg., J. Latenser, archt., 468 Saunders-Kennedy Bldg., et al, for constructing city hall and post office, for City and Treas. Dpt., Wash., D. C. $2,500,000.

N. Y., Buffalo—State Dpt. Educ., Education Bldg., Albany plans by W. Haugaard, State Bldg., Albany, constructing extension and altering Buffalo State Teachers College. $140,000. **Maturity indefinite.**

N. Y., Catskill—Memorial Hospital of Greene Co., 120 Broad St., bids in middle of June constructing hospital, Jefferson Heights. G. E. Lowe, 286 Wall St., Kingston, archt.

N. Y., Chaumont—Bd. Educ. postponed taking bids constructing school. $142,000. P.W.A. project. Project in abeyance. A. F. Gilbert, 385 5th Ave., New York, archt. Noted Dec. 4, C. D.—Dec. 12, E. N.-R.

★ **N. Y., Huntington**—Union School Dist. 3, election June 9, for appropriation of $550,000 for erecting Junior High School, for Bd. Educ., C. R. Huff, pres.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., plans by J. Lustig, c/o owner, altering heating, plumbing in hospital at City Hospital, Welfare Island. Est. about $37,000.

N. Y., New York — Dpt. Sanitation, 125 Worth St., plans by F. B. McDuffee, 125 Worth St., altering 3 story, service and section building, 128 West 17th St. Est. about $37,000 with equipment.

★ **†N. Y., Schenectady**—Schenectady Municipal Housing Authority, J. MacGathan, chn., plans program of slum rehabilitation, incl. constructing bus terminal, parking areas, new food center, industrial plants for small industry, $3,500,000. $800,000 P.W.A. grant and $2,700,000 bond issue. **Maturity this year.**

N. Y., Tottenville — Dpt. Sanitation, 125 Worth St., New York, plans by F. B. McDuffee, 125 Worth St., New York, constructing incinerator. $250,000.

★ **N. C., High Point**—City, E. M. Knox, mgr., filed application with P.W.A. for funds to finance construction power plant for city. Est. $3,551,761. Noted Oct. 25, C. D.—Oct. 27, E. N.-R.

★ **Okla., Tulsa**—Bd. Educ. revised plans by A. M. Atkinson, Thompson Bldg., steel, brick high school, South Harrison St. $600,000.

Pa., Sharpsville—Municipality, plans altering former Davison Coke & Iron Co. plant for tube and pipe works. To exceed $50,000. Western Steel Products Co., Sharpsville, lessee, H. B. Small, in charge.

†Tex., Fort Worth—Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids Mar. 31, constructing narcotic farm buildings. Will readvertise. Noted Apr. 1, C. D.—Apr. 9, E. N.-R.

Tex., Perryton—City plans power plant and distributing system. Est. $150,000. Bond election May 19 for same. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

★ **Man., Winnipeg**—Building Comr. W. A. Martin making plans school construction program. $955,000.

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Ont., Ottawa—Hon. R. Brugere, French Minister, in Canada, Laurier Ave. E., soon takes bids constructing new brick, stone legation building, plain found., Sussex St., for French Govt. $400,000. E. E. Beaudoni, Paris, France, archt. Leblanc & Montpetit, Montreal, Que., consult. archts. Noted Jan. 29, C. D.—Feb. 6, E. N.-R.

Ont., Ottawa—Ottawa Separate School Bd., E. C. Desormeaux, secy., plans new 17 room school in Dalhousie Ward, and 4 room school in Rideau Ward. $150,000. Architect not appointed. Noted May 14, C. D.

Ont., Sudbury—R. H. Martindale, genl. mgr. Ontario Hydro-Electric Power Comn., 7 Cedar St., soon takes bids substation increasing capacity to 6,000 kw., Annie and John Sts.

Que., Valcartier—Secretary Dpt. National Defence, Ottawa, Ont., soon takes bids constructing new armory for regular soldiers at Valcartier Camp, about 6 mi. north of Quebec City. $200,000.

BIDS ASKED

†Ala., Montevallo—June 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $65,000. Noted Oct. 21, C. D.—Oct. 24, E. N.-R.

Ala., Montgomery—May 27, by City, c/o W. A. Gunter, mayor, constructing 2 story, basement, 131x311 ft. city hall. $475,000. F. Lockwood, 119 Adams St., archt. J. S. Garrett, city engr.

†Colo., Delta—June 18, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $92,000.

†Colo., Loveland—June 19, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $75,000.

†Com., Glastonbury—June 11, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $72,000. Noted Feb. 10, C. D.—Feb. 13, E. N.-R.

Conn., Hartford—See "Contracts Awarded."

†Conn., West Haven—June 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $95,000. Noted Oct. 29, C. D.—Oct. 31, E. N.-R.

†Fla., Palm Beach—June 18, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $155,000.

†Fla., St. Augustine—June 2, by Dpt. Interior, Engineering Section, Natl. Park Service, constructing 1 administration office, 2 comfort stations, etc.

Ga., Athens—June 5, by President Regents of University System, boys' dormitory, girls' dormitory and agricultural extension building at University of Georgia. $271,000. R. H. Driftmier, Athens, archt.

†Ga., Swainsboro—June 11, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $65,000.

Ill., Chicago—May 26, by Bd. Educ., lighting fixtures for 13 schools, boiler, tank, pipe and duct covering for 2 schools, wiring and transformer vault for 4 schools. P.W.A. project. J. C. Christensen, 228 North LaSalle St., archt.

†La., Oakdale—June 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $62,000.

†Mass., Walpole—May 25 (extended date), by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

†Mich., Howell—June 11, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $70,000.

†Mo., Higginsville—June 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $64,000. Noted Feb. 4, C. D.—Feb. 6, E. N.-R.

†Neb., O'Neill—June 17, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $70,000.

N. J., Harrison—May 26, by Town, Tem. Mun. Bldg., 518 Harrison Ave., constructing new town hall, Harrison Ave. $225,000 plus. P.W.A. project. H. A. Kelly, 921 Bergen Ave., Jersey City, archt. Noted Jan. 30, C. D.—Feb. 6, E. N.-R.

†N. M., Deming—June 17, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $79,000.

†New York—June 2, by U. S. Eng., 710 Army Bldg., 39 Whitehall St., New York, dredging 30,250 cu.yd. place measurement from Great South Bay, Patchogue River.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Dryden—Central School Dist. 1, bids about May 21 on revised plans for school, James St. $305,000. P.W.A. project. Bids Apr. 10 rejected. C. W. Clark, 27 North Main St., Cortland, archt. Noetd Apr. 16, C. D.—Apr. 23, E. N.-R.

N. Y., Eaton—May 25, by Bd. Educ., Central School Dist. 1, towns of Eaton, Nelson, Lebanon, Fenner, Smithfield, Stockbridge, Madison Co., at School Bldg., Morrisville, for new school. $79,700. P.W.A. project. C. W. Clark, Cortland, archt. Noted Apr. 29, C. D.—May 7, E. N.-R.

N. Y., Jefferson—May 26, by Central School Dist. 1, electrical work for Jefferson Central School, towns of Jefferson, Blenheim, Gilboa, and Summit, Schoharie Co. and towns of Harpersfield and Kortright, Delaware Co. Conrad & Cummings, 99 Collier St., Binghamton, archts.; adv. E. N.-R., May 21. P.W.A. project. Noted May 8, C. D.—May 14, E. N.-R.

N. Y., Peekskill—May 26, by Bd. Trustees, Municipal Bldg., plumbing for proposed municipal building. P.W.A. project. F. Gallagher, village clk.

N. Y., South Dayton—Bd. Educ. Dist. 1, South Dayton, bids about May 23, on revised plans constructing school. R. A. Freeburg Bldg., Jamestown, archt. P.W.A. project. Bids Apr. 27 rejected. Noted May 4, C. D.—Apr. 23, E. N.-R.

†O., Georgetown—June 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Agricultural and Post Office Building, $60,000.

O., Minerva—May 26, by City, improvements and equipment for electric power plant, to exceed $37,000. H. R. Hadlow, 13325 Forest hills Ave., Cleveland, engr. Noted Mar. 13, C. D.—Mar. 26, E. N.-R.

†Okla., Oklahoma City—June 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing superstructure Rotary Park Housing Project, Project H-8101. Noted Dec. 5, C. D.—Dec. 12, E. N.-R., under "Contracts Awarded."

†Pa., Phila.—June 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., additions and alterations to U. S. Mint (protective work).

Tex., Ft. Davis — May 29, by Bd. Regents (State) Galveston and Austin (McDonald Observatory fund), erection of 9 room living quarters, 2 cottages, semi-fireproof, small power plant for generating electricity, etc., electric lines, water supply lines in vicinity of observatory at McDonald Observatory near here.

Tex., Galveston—May 30, by University of Texas, Bd. Regents, c/o J. W. Calhoun, comptroller, Austin, at office of Business Manager Galveston, new bids 4 story, brick, rein.-con. steel, face and common brick hospital (John Sealy Hospital for Crippled and Deformed Children). $200,000. P.W.A. project. R. L. White, 220 Guadalupe St., Austin, archt. Noted May 4, C. D.—Aug. 16, E. N.-R.

★ **Tex., Houston**—City, c/o O. F. Holcombe, mayor, J. M. Nagle, dir. P. Wks., bids about May 15, 1 story, steel frame, long span brick, stone extension to Sam Houston Hall 20,000 seating capacity in auditorium, 8 committee rooms and small auditorium. Est. $1,000,000. R. J. Cummins, Bankers Mortgage Bldg., engr. A. C. Finn, Bankers Mortgage Bldg., archt. Noted Feb. 10, C. D.—Feb. 13, E. N.-R.

†Tex., Legion—June 2, by Veterans Bureau, Arlington Bldg., Wash., D. C., installing electric fire alarm system for various buildings at U. S. Veterans Hospital Unit and other electrical services.

†Va., Norfolk—June 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing grease interceptor at U. S. Marine Hospital.

†Wash., Bremerton — June 1, by Yards & Docks, Navy Dpt., Wash., D. C., constructing freight elevator for Building 104, Puget Sound Navy Yard. $4,500.

†C. Z., Balboa—June 10, by Yards & Docks, Navy Dpt., Wash., D. C., constructing three 4 family officers' quarters at Naval Radio Station, Spec. 8120. Noted Apr. 13, C. D.—Apr. 16, E. N.-R.

†C. Z., Balboa Heights—June 25, by Con. Q.M., Panama Canal, constructing four 1 family type, 101 quarters, four 1 family type, 102 quarters, nine 2 family type, 103 quarters, five 2 family type, 108 official quarters and one 12 apartment bachelor quarters for American Employees, 9-12 family silver quarters and three 24-room bachelor quarters for artisans and laborers.

†C. Z., Fort Clayton—June 20, by Con. Q. M., Panama Canal, constructing 2 barracks buildings, with roads and utilities, here; adv. E. N.-R., May 21.

†T. H., Oahu—July 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing buildings at Naval Radio Station, Spec. 7891.

†Ont., Ottawa—May 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Legation Building.

CONTRACTS AWARDED

Calif., Alameda — A. Nelson, general contractor, 242 Ocean Ave., San Francisco, structural steel for high school reconstruction, to Schrader Iron Wks., 1247 Harrison St., for Alameda School Dist.•••reinforcing steel, to Gunn, Carle & Co., 20 Potrero Ave.•••electrical work, to Abbett Electric Co., 126 Sears St.•••plumbing, heating, and sheet metal, to F. Davison, 65 Chesley St.•••painting, to Aristo Painting Co., 473 Bryant St., all contractors of San Francisco. Noted Mar. 26, C. D.—Apr. 2, E. N.-R., under "Contracts Awarded."

Calif., Los Angeles—Los Angeles Bd. Educ., Chamber of Commerce Bldg., general contract constructing new main building, reconstructing, rehabilitating and strengthening auditorium section of main brick building at Ramona School, 1133 North Mariposa St., to N. W. Thiele, 507 South Lorena St., $132,260•••plumbing work and heating and ventilating, to Lohman Bros., 232 South Spring St., $8,467 and $9,119 respectively•••electrical work, to J. Korb, 5734 York Blvd., $4,077. Grand total $153,923. Bids Apr. 29, awarded May 4. Noted May 6, C. D.

Calif., San Francisco—Dpt. P. Wks., City Hall, general contract school machine shops, Fillmore St. near Bay St., to O. Monson, 475—6th St., $187,330•••mechanical equipment and

†Federal Government

Public Buildings (Continued)

plumbing to F. W. Snook Co., 596 Clay St., $23,193***electrical work, to United Electric Co., 1190 Bryant St., $8,317. Grand total $218,840. Bids Apr. 22, awarded May 11. Noted Apr. 28. C. D.

†**Calif., Selma**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S Post Office, to Wickes Eng. & Constr. Co., 1441 Bluff St., Des Moines, $58,150. Bids Apr. 14. Noted Apr. 16, C. D.—Mar. 12, E. N.-R.

†**Conn., Clinton**—Treas. Dpt. at office Sup. Archt., Wash., D. C., contsructing U. S. Post Office, to J. W. Mylchreest, 50 Brainard Ave., Middletown, Conn., $42,845. Bids Apr. 30. Noted May 5, C. D.—Apr. 9, E. N.-R.

Conn., Hartford—State, State Police Administration, 100 Washington St., garage, administration unit addition and barracks, Washington St. Owners build. W.P.A. Labor. Est. $140,000. Owners taking bids for excavating work and sewer construction. Golden Storrs & Co., 343 Fairfield Ave., archts. Bids May 12.

★ **Conn., Norwalk**—City, L. Downs, clk., City Hall, 3 story, brick, steel, stone high school, East Ave., to John H. Eisele Co., Inc., 18 East 41st St., New York, $511,000; electrical work, to Kenworthy & Taylor, 17 Spaulding St., Everett***plumbing, to Hauxwell & Smith, 46 Broad St., Port Chester, N. Y.***heating, to Johnston Heating Co., 306 East 26th St., New York, $903,000. P.W.A. Bids Apr. 30, awarded May 8. Noted May 8, C. D.—Apr. 23, E. N.-R.

Ind., Covington—Fountain Co. Bd. Comrs., Chamber of Commerce Bldg., Covington, general contract 3 story, basement court house, Public Square, tentatively awarded to Jacobson Bros. Co., 19 North LaSalle St., Chicago, Ill., $197,000. Subject to P.W.A. approval. Bids May 5, awarded May 8. Noted May 11, C. D.—Apr. 16, E. N.-R.

Ind., Decatur—Municipality, to General Electric Co., 230 Clark St., Chicago, Ill., 2,000 kwh. turbine engine and generator, $51,500; exciter, $4,800; and switchboard, $1,849***to Westinghouse Electric & Mfg. Co., Gulf Bldg., Pittsburgh, Pa., condenser and auxiliary, $19,755. Grand total $77,904. Est. $100,000. P.W.A. Bids May 7, awarded May 9. Noted Apr. 2, C. D.—Apr. 9, E. N.-R.

Mass., Andover—Town, J. C. Souter, secy. Building Comm., 41 Washington Ave., lighting fixtures for Junior High School, to Edwin C. Lewis, Inc., 121 Federal St., Boston, $2,759; gymnasium bleachers, to Chain Link Fence Co., 64 Pearl St., Brookline, $56. P.W.A. Bids Apr. 25 awarded May 11. Noted May 7, C. D.

Mass., Lowell—Aberthaw Co., 80 Federal St., Boston, general contractor, elevator in Hanchett Memorial Hospital unit, to Otis Elevator Co., 130 Clarendon Sq., Boston, for Lowell General Hospital, 339 Varnum Ave.***electrical work, to M. B. Foster Electric Co., 368 Congress St., Boston***heating, to J. E. Chatman, 27 Haymarket Sq., Boston. Noted May 11, C. D.—May 14, E. N.-R., under "Contracts Awarded."

Mass., Spencer—J. W. Bishop Co., general contractors, 109 Foster St., Worcester, heating and plumbing for David Prouty High School addition and alterations, to Thos. F. Harney & Sons, 12 Foster St., Worcester***building finish, to Carl Olson & Sons, Inc., 314 South Broadway, Lawrence***reinforcing steel, to Geo. F. Blake, Inc., 198 Mechanic St., Worcester***structural steel, to Stafford Iron Work, Inc., 135 Stafford St., Worcester***painting, to H. Newton Marshall Co., 522 Harrison Ave., Boston. Noted Jan. 17, C. D.—Jan. 23, E. N.-R., under "Contracts Awarded."

†**Mich., Saginaw**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing brick, steel U. S. Post Office, plain found., to H. Dattner, 1515 Barlum Tower, Detroit, Mich., $283,993. Bids Apr. 28. Noted May 1, C. D.—Apr. 9, E. N.-R.

Mo., Mexico—School Dist. 59 of Audrain Co., c/o F. Griffin, pres. Bd. of Educ., Mexico, heating system (either one-way air system or two-pipe vacuum heating), for 2 story, basement, Eugene Field Public School, to C. P. Berger, Mexico, $6,754. P.W.A. Bids Apr. 17. Noted Apr. 13, C. D.

Mo., West Plains—Howell Co., c/o County Court, general contract 3 story, rein.-con., brick, stone court house and jail, to L. H. Britton, Mountain Grove, $79,952. P.W.A. Bids Apr. 8. Noted Mar. 10, C. D.—Mar. 12, E. N.-R.

Neb., O'Neil—Holt Co., J. C. Gallagher, clk., general contract 63x91 ft. court house, 56 ft. high, to Peter Kiewitt Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, $81,890. P.W.A. Noted Apr. 21, C. D.

†**Nev., Carson City**—Treas. Dpt. at office Sup. Archt., Wash., D. C., installing one passenger elevator in U. S. Post Office and Court House, to Otis Elevator Co., 810 18th St. N.W., Wash., D. C., $19,690. Bids Apr. 17. Noted Apr. 21, C. D.—Apr. 2, E. N.-R.

†**N. J., Little Falls**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Balsamel Constr. Co., 1 Anderson Rd., Bernardsville, $49,632. Noted Apr. 21, C. D.—Mar. 26, E. N.-R.

N. J., Vineland—Boro, City Hall, Contr. 3, plumbing, drainage, and Contr. 13, piping for power plant for addition to municipal power plant, to B. F. Shaw, 2nd and Lombard Sts., Wilmington, Del. $89,000. Bids Apr. 27, awarded May 5. P.W.A. Noted May 13, C. D.—May 21, E. N.-R.

†*Federal Government*

N. Y., Arkport—Union Free School Dist. 1, heating and ventilating for school, East Ave., to M. J. Lippincott, 105 Canisteo St., Hornell***plumbing, to McGinity Johnson Co., 214 Prendergast St., Jamestown***electrical work, to R. H. Carter Electric Co., Hornell. P.W.A. Bids Apr. 18. Noted May 5, C. D.—May 7, E. N.-R., under "Contracts Awarded."

N. Y., Berlin—Rathgeb-Walsh Corp., general contractors, Portchester, mill work for school, for Bd. Educ., Central School Dist. 1, to Hornell Woodworking Co., Hornell; reinforcing steel, to Bethlehem Steel Co., Bethlehem, Pa. P.W.A. Noted Apr. 3, C. D.—Apr. 9, E. N.-R., under "Contracts Awarded."

N. Y., Brooklyn—Dpt. Sanitation, 125 Worth St., New York, altering 2 story service and storage building, 59 Amity St., relief labor, $38,000. W.P.A. Owner is purchasing materials. F. B. McDuffee, 125 Worth St., New York, archt.

N. Y., Clymer—Haas Constr. Co., general contractors, 1001 Monroe St., Jamestown, reinforcing steel and steel joists for school, for Bd. Educ., to Truscon Steel Co., Sidway Bldg., Buffalo. P.W.A. Noted Apr. 24, C. D.—Apr. 30, E. N.-R., under "Contracts Awarded."

N. Y., Morrisville—Central School Dist. 1, general contract school, to Kraft & Detor, 460 Kirk Ave., Syracuse. Est. $226,875. P.W.A. Bids May 1. Noted Apr. 6, C. D.—Apr. 23, E. N.-R.

N. Y., Morrisville—Central School Dist. 1, plumbing for school, to Hameline Co., Inc., 529 West Oriskany St., Utica***heating, to D. C. Group, 240 East Erie Blvd., Syracuse***electrical work, to Doster & Egan, 240 East Erie Blvd., Syracuse. P.W.A. Bids May 1. Noted May 6, C. D.—Apr. 23, E. N.-R.

N. Y., Prattsburgh—Bd. Educ. Central School Dist. 1, general contract school, to A. Friederich & Sons Co., 710 Lake Ave., Rochester, $111,980. P.W.A. Noted May 6, C. D.—Apr. 23, E. N.-R.

N. Y., Sherman—Bd. Educ. Dist. 1, general contract school, to J. M. Benzinger, Inc., Gorkey Bldg., Jamestown***plumbing and heating, to Jamestown Plumbing & Heating Co., 120 Cherry St., Jamestown***electrical work, to Linquest Electric Co., 309 North Main St., Jamestown. Est. $155,000. Subject to P.W.A. approval. Bids May 1. Noted May 6, C. D.—Apr. 23, E. N.-R.

★ **N. Y., Union Springs**—Bd. Educ. School Dist. 1, general contract school, to E. L. Van Sickel & Co., Hooker-Fulton Bldg., Bradford, Pa. Est. $518,000. P.W.A. Noted May 4, C. D.—Apr. 16, E. N.-R.

N. Y., Union Springs—Bd. Educ. Central School Dist. 1, plumbing for school, to Ralph E. Lewis, 60 Lincoln Ave., Cortland***heating, to D. C. Group, 240 East Erie Blvd., Syracuse ***electrical work, to Vanderlinde Electric Corp., 52 Charlotte St., Rochester. P.W.A. Noted May 4, C. D.—Apr. 16, E. N.-R., under "Contracts Awarded."

N. D., Dickinson—Stark Co., c/o M. F. Lenhardt, aud., superstructure 2 story, basement, 99x125 ft., rein.-con., brick, tile court house, to S. W. Jonason & Co., Aberdeen, S. D., $138,365***heating and plumbing, to J. C. Canning, Williston, $19,563***wiring, to Skeels & Melville, Bismarck, $6,190. Grand total $164,118. P.W.A. Noted Apr. 16, C. D.—Apr. 23, E. N.-R.

†**O., East Palestine**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Structural Eng. Corp., 110 East 42nd St., New York, $45,930. Bids Apr. 22. Noted Apr. 27, C. D.—Apr. 2, E. N.-R.

O., Madeira—Bd. Educ., general contract constructing Madeira School, to Penker Constr. Co., 1030 Summer St., Cincinnati, $96,869*** plumbing, to W. Hillenbrand Co., 1124 Omena St., Cincinnati, $7,896***heating, ventilating, temperature control, to Peck Hannaford & Briggs, Court and Sycamore Sts., Cincinnati, $15,836***electrical work, to Beltzhoover Electric Co., 4th and Plum Sts., Cincinnati, $7,227. Grand total $127,828. P.W.A. Noted Apr. 7, C. D.—Apr. 9, E. N.-R.

†**Okla., Blackwell**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. I. Barnes, Springfield, Mo., $55,300. Noted Mar. 24, C. D.—Feb. 27, E. N.-R.

Pa., Greensburg—Commonwealth of Pennsylvania, general contract 1 story, part basement, 62x339 ft. garage, office and heating plant, 2 wings each 62x104 ft., and office wing of 50x70 ft., brick, rein.-con., glazed wall tile, Indiana limestone, etc., Lincoln Highway, to Baker & Coombs, Demain St., Morgantown, W. Va., $132,920***heating and plumbing, to W. M. Clark Co., 205 South Beaver St., New Castle, $10,320 and $7,500 respectively***electrical work, to Marvin Electric Co., New Castle, $7,590. Grand total $160,330. Bids Apr. 22. Noted May 1, C. D.—Mar. 19, E. N.-R.

R. I., Howard (Cranston)—Gilbane Building Co., general contractors, 86 Calverly St., Providence, electrical work for patients' and employees' cafeteria, at State Hospital, to Broadway Electric Shop, 484 Broadway, Providence, for State, Emergency P. Wks. Comn., State House, Providence. Noted May 1, C. D.—May 7, E. N.-R.

R. I., Howard (Cranston)—State, Public Works Comn., State House, Providence, general contract 3 story, basement, brick, steel, stone hospital building at State Infirmary, concrete found., to Matthew Cummings Co., 43 Tremont St., Boston, Mass., $229,000***heating, to Taylor Heating Co., 714 Broad St., Providence, $13,425***plumbing, to Thos. R. Douglas, 8 Slocum St., Providence, $15,625***electrical work, to Scannevin & Potter, 189 Pine St., Providence, $8,275***elevator, to Otis Elevator Co., 124 Franklin St., Providence, $7,541. Grand total $273,866. Bids Apr. 23, awarded about May 11. P.W.A. Noted May 4, C. D.

Utah, Provo—State, c/o State Building Comn., Capitol Bldg., Salt Lake City, improving State Mental Hospital heating plant, to J. J. Burke Co., Kearns Bldg., Salt Lake City, $43,577. P.W.A. Bids Apr. 28. Noted Apr. 15, C. D.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Los Angeles—Mr. Hoover, c/o P. R. Williams, archt., 3839 Wilshire Blvd., plans 1 and 2 story apartment and basement garage, rein.-con., stucco, Sunset Plaza Drive and Sunset Blvd. $150,000.

Calif., Santa Rosa—Santa Rosa Hotel Co. plans hotel. Est. about $150,000. **Maturity indefinite.** Architect not appointed.

Conn., Bridgeport—Holy Ghost Russian Orthodox Parish, A. Veniaminoff, pastor, 1520 East Main St., soon lets contract 1 story, basement, 65x120 ft., brick, stone church, incl. 110 ft. tower, with steeple and chimes, Pearl and East Main Sts. $140,000. Noted May 11, C. D.—May 14, E. N.-R.

Ia., Waterloo—Dairy Cattle Congress, E. E. Estel, mgr., soon takes bids 214x304 ft., concrete, steel hippodrome building.

Miss., Tupelo—North Mississippi Community Hospital Corp., c/o B. W. Reed, pres., plans by H. C. Pelton & J. G. Rogers, 415 Lexington Ave., New York, 2 story, basement, brick, stone trim 50 bed hospital building, also 2 story, basement, brick nurses' home in suburban Tupelo on Miss. Hy. 55. $300,000. Commonwealth fund of New York City donated $260,000, citizens of Tupelo donated $40,000 toward cost.

N. J., Madison—E. C. Pomeroy, c/o J. S. Shanley, archt., 33 Washington St., Newark, plans 28 houses, on Pomeroy Ave. $168,000 plus. Contracts for 2 homes awarded to R. O. Brown, 117 Madison Ave.

N. J., Millington—T. & D. S. Meister, Inc., 292 Madison Ave., New York, plans tract development and dwellings, on (194 acres) Springfield Ave. To exceed $140,000. Site acquired, Architect not appointed.

N. M., Hobbs—Rex Theatres, Rex Theatre Bldg., Hobbs, plans constructing theatre and store. Est. about $140,000. **Maturity indefinite.** Architect not appointed.

N. Y., Albany—E. Rooney atty., 35 State St., soon takes bids electrical elevator installation in Broadway Arcade Building, for Keller Holding Corp., R. Keeler, mgr., $25,000 unofficial.

N. Y., Brooklyn—Brooklyn Ridgewood Corp., 6th Ave. and 50th St., New York, bids in October or later, constructing theatre, $250,000. T. W. Lamb, 701 7th Ave., New York, archt. Noted Jan. 10, C. D.—Jan. 17, E. N.-R.

N. Y., Brooklyn—Kings Highway Theatre Corp., R.K.O. Bldg., New York bids in October or later, constructing theatre, Kings Highway and Ocean Ave. $250,000. Noted Jan. 14, C. D.—Jan. 17, E. N.-R.

N. Y., Brooklyn—Twin Oakes Realty Corp., 1603 Flatbush Ave., plans by Lama & Proskauer, 383 Jay St., group brick dwellings, East 49th St. near Beverly Rd. Est. about $140,000.

★ **N. Y., Brooklyn**—E. L. Vivian, 835 5th Ave., New York, indefinitely postponed taking bids constructing 6 story apartment, Atlantic Ave. and Beach 42nd St. $500,000. Scacchetti & Siegel, 1860 Bway., New York, archts.

N. Y., Brooklyn—Monarch Realty Corp., 391 Fulton St., plans by W. Lacerenza, 391 Fulton St., constructing group 1 story, brick dwellings, 1606 Avenue W. $140,000.

N. Y., Buffalo—Buffalo Savings Bank, Main St., soon lets contract altering bank, incl. air conditioning system. To exceed $105,000. Green & James, 1 Niagara Sq., archts.

N. Y., Buffalo—Y. M. C. A., 45 West Mohawk St., soon lets contract addition and complete renovation of present building, incl. plumbing, heating, electrical work. North & Shelgren, Crosby Bldg., archt. Noted Apr. 8, C. D.

N. Y., Elmhurst—Airhill Realty Corp., c/o Oppenheimer Realty & Management Corp., 2510 Bway., New York, plans group frame dwellings, 74th St. near Calamus Ave. To exceed $150,000. Site purchased.

N. Y., Elmhurst — Wellington Apartments, Inc., 26 Court St., Brooklyn, plans by M. N. Weinstein, 93 Court St., Brooklyn, 6 story, 192x130 ft. apartment, Whitney Ave. and Case St. $375,000.

N. Y., Flushing—Jaxland Realty Co., 142nd St., plans by J. Unger, 39-01 Main St., group 2½ story, brick dwellings, 56th Rd. and 146th Ave., and other locations. $140,000.

N. Y., Flushing—J. Stankewitch, 40-45 74th St., Jackson Heights, plans group frame, 2 story dwellings, 59th Ave. near Main St. $140,000. Private plans.

N. Y., Hollis—Labsal Realty Co., 60-60 Myrtle Ave., Ridgewood, plans by L. Danancher, 147-25 Jamaica Ave., Jamaica, constructing group 2 story, frame dwellings, 90th Ave. and 221st St. $140,000.

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Commercial Buildings (Continued)

N. Y., Jamaica—Jamaica Fulton Operating Co., R.K.O. Bldg., 6th Ave. and 50th St., New York, bids in November or later, constructing theatre, Jamaica Ave. and West 169th St. $255,000. R.K.O., lessee. T. W. Lamb, 701 7th Ave., New York, archt. Noted Jan. 14, C. D.—Jan. 17, E. N.-R.

N. Y., Jamaica — Briarwood Estates, 69-50 Ingram St., Forest Hills, plans by A. A. Marjey, 110 West 40th St., constructing group 2 story, frame dwellings, Coolidge Ave. and 141st St. $140,000.

★ **N. Y., Jamaica**—Gross-Morton Corp., Utopia Parkway and Union Turnpike, plans group 500 dwellings on 50 acre tract, Utopia Parkway and Union Turnpike. To exceed $1,000,000. Property just purchased.

N. Y., Long Island City—Weldon Realty Corp., 31-17 30th Ave., plans by C. W. Marsac, 31-16 30th Ave., group 4 story tenements, 34th St. and 30th Ave. Est. about $140,000.

N. Y., Middletown—Orange County Telephone Co., 19 John St., new bids early in June, constructing telephone exchange, 19 John St. Bids May 4 rejected. R. R. Graham, 25 Prospect St., archt. E. E. Seelye & Co., 101 Park Ave., New York, engrs. Noted May 12, C. D.—May 14, E. N.-R.

N. Y., Newburgh—Luthern Church of Newburgh, 145 Miller St., plans by P. Hanford, 75 2nd St., Newburgh, constructing church at Fullerton Ave. and South St.

N. Y., New York—S. Bernstein, 15 East 40th St., plans by C. B. Meyers, 31 Union Sq., altering heating and plumbing in 6 story, store and apartment, 235 West 24th St. $38,000.

★ **N. Y., New York**—Corporation, c/o J. Perlbinder, 535 5th Ave., plans by H. I. Feldman, 15 West 44th St., 6 story apartment, Sheridan Ave. and McClellan St. $700,000.

N. Y., New York—G. and G. Realty Corp., 3674 Bronx Blvd., plans by F. J. Ross, c/o owner, constructing group 2 story, brick, frame dwellings, Liebig Ave. and 250th St., and other locations. $140,000.

N. Y., New York—Gaetano Noto, 1806 Muliner Ave., plans by R. J. Marx, 3525 Eastchester Rd., 6 story apartment, 180th St. and Bryant Ave. $180,000.

N. Y., New York—Greenwood Cemetery, 52 Vanderbilt Ave., plans by A. Weiser, engr. and archt., 240 Madison Ave., altering heating and plumbing in 6 story apartment, 18 Jefferson St. $55,000.

N. Y., New York—Grisget Realty Corp., 215 East 149th St., plans by H. I. Feldman, 15 West 44th St., 6 story apartment, 277 Fort Washington Ave. Est. about $140,000.

N. Y., New York—Joban Realty Corp., 975 Walton Ave., plans by Miller & Goldhammer, 40 East 49th St., constructing 6 story apartment, near 153rd St. and Gerard Ave. $140,000.

N. Y., New York—M. J. Kramer, 580 5th Ave., plans constructing motion picture theatre, 127 East 23rd St. $250,000. Architect not appointed. Site acquired.

N. Y., New York—Marmion Realty Corp., 765 East 175th St., plans by H. Ginsbern, 205 East 42nd St., 6 story, 46x109 ft., brick apartment, Marmion Ave. and 175th St. Est. about $140,000.

N. Y., New York—Norcald Realty Corp., 1070 Anderson Ave., plans by H. Ginsbern, 205 East 42nd St., constructing 6 story apartment, Anderson Ave. and 166th St. $250,000.

★ **N. Y., New York**—New York Infirmary for Women and Children, 312 East 51st St., sketches by W. L. Bottomley, 112 East 55th St., constructing hospital group, Stuyvesant Square. $3,000,000. **Maturity indefinite.**

N. Y., New York — Park and 46th Street Corp., 11 East 47th St., plans by Francisco & Jacobus, 511 5th Ave., altering food testing kitchens, 250 Park Ave. **Est. about $37,000** with equipment.

N. Y., New York—Rosa Realty Corp., 165 East 156th St., plans by C. Kreymborg, 349 East 149th St., constructing 6 story apartment, 89 Park Terrace. $140,000.

N. Y., Schenectady—J. M. Ryder, archt., 122 Jay St., soon lets contract hospital, 124 Rosa Rd., for Eastern New York Orthopedic Hospital, Inc., 1090 Baker Ave. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

N. Y., Winfield—Hyatt Realty Corp., 5300 65th Pl., Winfield, plans by B. Driesler, Jr., 152 Remsen St., Brooklyn, constructing group 2 story, brick, frame dwellings, 64th St. and 53rd Ave. $140,000.

N. Y., Woodhaven—True Homes, Inc., 163-18 Jamaica Ave., plans by D. J. Levinson, 161-02 84th Dr., Jamaica, group 1 story, brick dwellings, 33rd Ave. and 86th St. $140,000.

Tex., San Antonio—Joske Bros. Co., c/o M. Calvert, pres., Alamo Plaza, plans installing air conditioning system in 5 story, basement department store building. Engineer, c/o owner, engr.

BIDS ASKED

Conn., Meriden—May 28, by St. Mary's Roman Catholic Parish, A. Kaicher, pastor, 2 story, basement, brick, stone parochial school, convent and parish house, Grove St. $140,000. G. Zunner, 182 High St., Hartford, archt. Noted Mar. 19, C. D.—Mar. 26, E. N.-R.

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N. Y., Albany—Our Lady Help of Christians, 17 Steuben St., taking bids constructing convent and chapel, 2nd Ave. $150,000. Gander, Gander & Gander, 17 Steuben St., archts. Noted Apr. 7, C. D.—Apr. 9, E. N.-R.

N. Y., Albany—St. Theresa's Roman Catholic Church, 442 New Scotland Ave., taking bids large brick, steel church, plain found., New Scotland Ave. A. L. Delehanty, 450 Ontario St., archt.

N. Y., East Hampton — See "Contracts Awarded."

N. Y., Flushing—See "Contracts Awarded."

N. Y., Middle Village—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco—The Emporium, Market St. at Powell St., escalators, to Otis Elevator Co., 1 Beach St. Total est. $200,000 which does not include preparatory work for installation.

Calif., San Francisco—Lindgren & Swinerton, general contractors, 225 Bush St., steel windows for department store additions, for Roose Bros., Market and Stockton Sts., to Pfeffer Iron Wks., 10th and Harrison Sts.•••copper flashing, to Morrison & Co., 74 Duboce Ave.•••glass bricks, to Vitrolite Constr. Co., 1490 Mission St.•••structural tile, to W. S. Dickey Clay Mfg. Co., Rialto Bldg.•••fire doors, to Soule Steel Co., 1750 Army St. Noted Mar. 24, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

Calif., West Los Angeles—Twentieth Century-Fox Film Corp., 10,260 Orton Ave., 1 story, 135 x 212 ft. sound stage, composition roofing, steel roof, sound deadening, sheet metal work, heating and ventilating systems, automatic water heater, etc., to Myers Bros., 3407 San Fernando Rd., $339,880. Awarded May 6. Noted May 6 C. D.—May 14 E. N.-R.

D. C., Wash.—Associated Constructors, Inc., general contractors, Market St., Natl. Bank Bldg., Phila., Pa., structural steel for theatre, to Dietrich Bros., Chandler Bldg., Wash., D. C., for Warner Bros. Pictures Inc., 321 West 24th St. Noted Apr. 23 C. D.—Apr. 30, E. N.-R., under "Contracts Awarded."

Mich., Detroit — Central Methodist Church, Woodward and Adams Aves., altering and constructing 2 story, basement, brick, steel church addition, incl. reconstruction of tower, to Bryant & Detwiler Co., Penobscot Bldg. Est. $200,000. Awarded May 11. Smith Hinchman & Grylls, Marquette Bldg., engrs.

N. J., East Orange—Washington Crest Apartment, Inc., 191 Joralemon St., Brooklyn, N. Y., constructing 4 story, basement apartment house, Washington St. $200,000. Owner builds. A. Prober, 16 Court St., Brooklyn, N. Y., archt.

N. J., Madison—See "Proposed Work."

N. J., Summit—Commonwealth Land Co., 382 Springfield Ave., constructing seven residences in Druid Hill and Plymouth Rd. Est. about $140,000. Owner builds and purchases materials. F. C. Van Duzer, in charge.

N. Y., Amagansett—R. B. Allen Corp., 500 5th Ave., New York, and East Hampton constructing 40 cottages, streets, waterlines and sewers on Montauk Devon Beach. Owner builds and purchases materials. Est. about $140,000. R. B. Webb, c/o owner, archt. Noted Apr. 23, C. D.—Apr. 30, E. N.-R.

N. Y., Brooklyn—Moses Lipshitz, 66 Court St., constructing 6 story, brick apartment, Avenue I and East 17th St., separate contracts now being awarded. $220,000. Kavy & Kavovitt, 16 Court St., archts. Noted Apr. 17, C. D.—Apr. 23, E. N.-R.

N. Y., Brooklyn—Merida Holding Corp., 186 Remsen St., 6 story apartment, East 26th St. and Kings Highway, separate contracts now being awarded. $175,000. M. N. Weinstein, 93 Court St., archt. Noted Apr. 17, C. D.—Apr. 23, E. N.-R.

N. Y., Elmhurst—Solita Corp., 485 Madison Ave., New York, constructing group 50 brick dwellings, Hillyer St. and Kneeland Ave., separate contracts now being awarded. To exceed $200,000. A. E. Allen, Garden City, archt. Noted Apr. 20, C. D.—Apr. 23, E. N.-R.

N. Y., Flushing—Ambassador Realty Corp., Linden Blvd., St. Albans, group 2 story, frame dwellings, 226th and Main Sts., separate contracts awarded on 1st unit of 7 dwellings. $140,000. A. E. Allen, Garden City, archt. Noted Apr. 13, C. D.—Apr. 16, E. N.-R.

N. Y., Flushing—Oakland Realty Corp., 59-11 Queens Blvd., Woodside, group 30 or more 2 story dwellings, Byrd St. and Elden Ave., day labor and separate contracts. $140,000. Owner is now purchasing materials. A. E. Allen, Garden City, archt.

N. Y., Middle Village—Brock White Homes, Inc., 76-01 Roosevelt Ave., Jackson Heights, constructing group 2 story, frame dwellings, 80th and 57th Sts., day labor and separate contracts. $140,000. Owner is purchasing materials. S. M. Palm, 159-15 Northern Blvd., Flushing, archt. Noted Apr. 20, C. D.—Apr. 23, E. N.-R.

N. Y., New York—Bradby Realty Corp., 2750 Boston Rd., constructing 6 story, 104x106 ft. apartment, Creston Ave. near 182nd St., separate contracts now being awarded. $200,000. J. M. Felson, 250 West 57th St., New York, archt.

N. Y., New York—Valentine Equities Inc., 1115 East 177th St., constructing 5 story apartment, Valentine Ave. near 184th St., separate contracts now being awarded. $175,000. J. M. Felson, 250 West 57th St., archt.

N. Y., Woodside—Fredlen Realty Corp., 14[illegible] 31st Ave., Long Island City, constructing 4 st[illegible] tenements and stores, 60th St. and Woods[illegible] Ave., separate contracts now being award[illegible] $140,000. Wuest & Bailey, 32-02 30th A[illegible] Long Island City, archts. Noted Apr. 20, C[illegible] —Apr. 23, E. N.-R.

Ont., Forest Hill—Village Theatres Ltd., [illegible] Bay St., Toronto, general contract construct[illegible] 1 story, basement, brick, steel theatre, pl[illegible] found., to Principal Investments Ltd., 465 [illegible] St., Toronto. Est. $100,000 plus.

Ont., Ottawa—Bell Telephone Co. of Can[illegible] Ltd., 1050 Beaver Hall Hill, Montreal, Que., [illegible] D. Laurie, dist. mgr., Bell Telephone Bl[illegible] Ottawa, constructing 4 story, basement, rein con., brick telephone exchange, O'Connor S[illegible] to Redfern Constr. Co. Ltd., Montreal, Qu[illegible] about $400,000. Noted Apr. 15, C. D.

Que., Montreal—Premier Constr. Co. Ltd., [illegible] Max M. Kalmaro, 630 Dorchester St. W., co[illegible] structing 30 brick houses, plain founds., Hami[illegible] stead St., to Gerard Martel, Inc., 2253 Belgrav[illegible] St. Est. $210,000. A. S. Wilkins, 1178 Phi[illegible] lips Pl., archt.

INDUSTRIAL BUILDINGS

PROPOSED WORK

★ **Calif., Los Angeles**—FACTORY—Studebak[illegible] Motors Corp., 4530 Loma Vista Ave., plan[illegible] new body plant addition to adjoin present fa[illegible] tory, located in Central Manufacturing Distric[illegible] Est. $1,000,000. Architect not appointed. [illegible] K. Whittaker, pres.

Calif., Ventura—PACKING HOUSES—Owner[illegible] at Rancho Sespe, Ventura Co., plans by R. [illegible] Wilson, Say Rd., Santa Paula, 1 story, base[illegible] ment, 132x140 ft. lemon packing house addi[illegible] tion, rein.-con., at Rancho Sespe, $45,000; also [illegible] 110x154 ft., concrete orange packing house [illegible] $42,000.

Conn., Waterbury—PLANT—Largay Brewing Co., Inc., 1090 Bank St., plans completed by Shattuck & Layor, 221 North La Salle St., Chicago, Ill., 2 story, brick, steel, concrete brewery addition, Bank St. $40,000.

Mass., Pittsfield—STORAGE—Gulf Oil Refining Co., Pittsfield, and 7th and Grant Sts., Pittsburgh, Pa., plans altering and repairing storage plant damaged by explosion. Est. $38,000. Private plans.

Mass., Springfield—FACTORY—C. W. Haynes Laboratories, Inc., E. F. Bessette, pres., Hampden St., plans factory. To exceed $37,000. **Maturity indefinite.** Private plans.

Mich., Bay City—PLANT—Electric Auto-Lite Co., Champlain and Mulberry Sts., Toledo, O., plans improving recently acquired plant of Wildman Rubber Co. Architect not appointed. Est. $37,000 with equipment.

Neb., Lincoln—ICE CREAM PLANT, etc.—Roberts Dairy Co., 220 South 20th St., Lincoln, plans constructing ice cream, cheese, dairy products plant, incl. cold storage, refrigeration equipment, etc. $50,000 for building, $40,000 for equipment. J. R. Roberts, in charge.

N. J., Atlantic City—GARAGE and SHOP—International Garage, 2211 Atlantic Ave., plans garage and shop. To exceed $40,000. Architect not appointed.

N. J., Hoboken—PLANT—Universal Folding Box Co., 94 34th St., Brooklyn, bids latter part of June, reconditioning former Gatti McQuade plant, Monroe and 12th Sts. To exceed $40,000.

N. Y., Buffalo—BREWERY—Iroquois Beverage Co., 230 Pratt St., plans brewery addition. $250,000.

N. Y., Buffalo—GRAIN ELEVATOR, etc.—G. L. F. Mills, Inc., Chamber of Commerce, plans constructing mill addition, incl. warehouse, grain elevator and dock improvements, Ganson St. $150,000.

N. Y., Buffalo—PLANT—Industrial Minerals Corp. of America, Jackson Bldg., R. E. Lowther, pres., plans constructing vermiculite ore milling plant, on waterfront. $100,000. **Maturity in fall.**

N. Y., Jamaica—GARAGE, etc.—Greater City Service Station, Inc., E. A. Dangler, 32-04 Steinway Ave., Long Island City, plans constructing garage, shop and service station, Queens Blvd. near Hillside Ave. $38,000 with equipment.

N. Y., Jamestown — FACTORY — Jamestown Metal Equipment Co., Inc., E. Card, in charge, Allen St., soon lets general contract, heating, plumbing, electrical work, sprinkler system, for 2 story, basement factory. To exceed $100,000. Private plans.

N. Y., Long Island City—MILK DEPOT—Owner, c/o Queensboro Farm Products, Inc., 35-13 41st St., plans altering factory into milk depot, 35-24 41st St. $37,000 with equipment.

N. Y., Long Island City — PLANT, etc.—Nichols Copper Co., 43-09 55th Dr., plans plant improvements and crane runway, 43-09 55th Dr. Private plans. $65,000.

N. Y., New York—GARAGE, etc.—DeWitt M. Lockman, 222 West 59th St., plans by A. E. Straker, 168 West 23rd St., 2 story,

†*Federal Government*

Industrial Buildings (Continued)

brick garage and storage, 512 West 20th St. $47,000 with equipment.

Tex., Harlingen—PACKING PLANT—Angle-American Syndicate, c/o Adams Gardens Tract, or R. D. McCarter, 70 Pine St., New York, and L. M. Taylor, engrs., plans 2 story, rein.-con., brick modern citrus packing plant, plain found. To exceed $38,000.

Utah, Ephraim—PLANT—Utah Poultry Producers Cooperative Assn.; 1800 South West Temple St., Salt Lake City, plans 1 story, 70 x 100 ft. poultry dressing and storage plant. $45,000. Architect not appointed.

Vt., Brattleboro—SHOE FACTORY—Corporation, headed by J. E. Bushnell, pres. Bd. Trade, plans shoe factory. Bridge St. $50,000. **Maturity indefinite.** Private plans. Daly Bros., Inc., Brattleboro (shoe manufacturers), lessee.

Va., Martinsville—PLANT—American Truck & Body Co. plans 1 story plant. $50,000.

Wash., Bellingham — PLYWOOD PLANT — Bellingham Plywood Co. (company incorporated with capitalization of $200,000), negotiating with Bellingham Port Comn., for site on Squalicum Creek, and plans plywood plant. $450,000.

W. Va., Nitro—RAYON PLANT—Viscose Co., 200 Madison Ave., New York, plans addition to rayon plant. $200,000.

★ **Alta., Edmonton**—MINES—Gilbert Labine, pres. Eldorado Mines Ltd., plans developing mines in Great Bear Lake Dist. To exceed $400,000.

Ontario — MINING — Skookum Gold Mines Ltd., c/o John C. Elder, 113 Braemar St., Toronto, plans gold mining development in Red Lake Dist. To exceed $150,000.

Ont., London — PLANT — Aluminex Thermo Seal Ltd., H. E. Wilkins, mgr., 305 William St., plans installing special equipment for manufacturing insulation for houses and buildings. Est. $50,000.

BIDS ASKED

★ **Calif., Oakland** — GLASS PLANT — P. J. Walker Co., managers of construction, Sharon Bldg., San Francisco, taking bids structural steel and concrete work for glass manufacturing plant, Alameda and Fruitvale Aves., for Owens-Illinois Pacific Coast Co., 85 2nd St., San Francisco. Total est. exceeds $1,000,000. Noted Apr. 24, C. D.—Apr. 30, E. N.-R.

Calif., Woodbridge—WINERY—E. G. Ernst, archt., 9 West Cleveland St., Stockton, taking bids rein.-con., wood frame and galvanized iron distilling plant, for Del Rio Winery, c/o architect. Noted Apr. 7, C. D.—Apr. 9, E. N.-R.

Ind., Anderson—FACTORY—Pierce Governor Co., 1525 Ohio Ave., taking bids 1 story, 50x100 ft. factory addition, Ohio Ave. $50,000. E. R. Watkins, Citizens Bank Bldg., archt.

Mass., Worcester — SHOP — See "Contracts Awarded."

Nev., Mountain City—ORE FLOTATION MILL —See "Contracts Awarded."

N. J., Newark—STORAGE, etc.—De Cozen Motor Co., 1226 Broad St., taking bids 1 story, basement, 100x110 ft. automobile storage and showroom, Broad St. $40,000 or more. J. DiStasio & Co., 136 Liberty St., New York, engrs.

N. J., Newark—WAREHOUSE—See "Contracts Awarded."

N. Y., Buffalo—PLANT—Worthington Pump & Mchy. Corp., Clinton and Roberts Sts., Buffalo and Harrison, N. J., taking bids constructing plant addition, Clinton St. To exceed $40,000. Private plans. E. Schwanhauser, mgr.

N. Y., Liberty—STORAGE, etc.—See "Contracts Awarded."

N. Y., Long Island City—PLANT—See "Contracts Awarded."

★ **N. Y., Rochester**—STEAM TURBINE GENERATING PLANT—Rochester Gas & Electric Corp., 89 East Ave., taking bids general contract steam turbine generating plant, $1,000,000. Equipment contracts already awarded. E. M. Gilbert Eng. Corp., 512 Washington St., Reading, Pa., archt. Noted May 7, C. D.—May 14, E. N.-R.

Wash., Seattle—WAREHOUSE—See "Contracts Awarded."

Wash., Tacoma—PULP PLANT—See "Contracts Awarded."

N. B., Dalhousie — TURBO-GENERATOR STEAM UNIT—See "Contracts Awarded."

Ont., Hamilton—FACTORY—Gerland Shipman Co., Bell Telephone Bldg., London, taking bids 1 story, brick, steel factory, 45x45 ft. boiler house and stack. Owner makes paper for paper containers and is interested in prices special equipment. Noted Apr. 23, C. D.—Apr. 30, E.N.-R.

CONTRACTS AWARDED

Calif., Long Beach—MILL and STORAGE, etc. Pacific Oil & Meal Co., West 7th St., 110 x 120 ft., mill and storage building and 100 x 150 ft. storage warehouse, steel frame construction, etc., to Western Eng. Co., Garland, Tex., local representative Mr. Emery, 685 Chamber of Commerce Bldg., Los Angeles, about $180,000.

Conn., Hartford — WAREHOUSE, etc. — Colt Patent Fire Arms Mfg. Co., S. M. Stone, pres., 17 Van Dyke Ave., 2 story, 120x200 ft., brick, steel warehouse and employees' recreation unit, to R. G. Bent Co., 93 Edwards St. Est. $120,000 Noted May 6, C. D.—May 14, E. N.-R.

Ga., Columbus—MILL—Swift Mfg. Co., constructing mill addition, to A. K. Adams Co., Plum St. N.W., Atlanta. Est. $40,000. Noted Apr. 22, C. D.—Apr. 30, E. N.-R.

Mass., Boston — GARAGE — Hegeman-Harris Co., general contractors, 185 Devonshire St., 1,000 tons structural steel for garage, to Lehigh Structural Steel Co., Allentown, Pa., for Railway Express Co., R. W. Thompson, supt. Buildings, 219 East 42nd St., New York. Noted Apr. 24, C. D.—Apr. 30, E. N.-R., under "Contracts Awarded."

★ **Mass., Cambridge** — MARKET — Boston Regional Produce Market, Inc., c/o L. S. Ollis, 131 Lexington St., Waltham, concrete foundations for produce market, Concord Ave. and Alewife Brook Parkway, to Canter Constr. Co., 6 Beacon St., Boston. Total est. $1,000,000. Noted July 17, C. D.—July 25, E. N.-R., under "Contracts Awarded."

Mass., Lynn — BOILER PLANT — Stone & Webster Eng. Corp., archts. and engrs., 49 Federal St., Boston, electrical work for boiler plant, Broad St., to Hixon Electric Co., 22 Elkins St., South Boston, for Lynn Gas & Electric Co., 90 Exchange St. Noted Mar. 20, C. D. —Mar. 26, E. N.-R., under "Contracts Awarded."

Mass., Lynn—SUPER-SERVICE STATION—Shell Eastern Petroleum Products, Inc., 787 Commonwealth Ave., Boston, 1 story, 25x60 ft., steel, cast stone super service station, concrete found., Liberty St. and Central Ave., to Platt Constr. Co., 88 Tremont St., Boston. Est. exceeds $37,000 with equipment. Noted Aug. 12, C. D.—Aug. 15, E. N.-R.

Mass., Worcester—SHOP—Worcester Street Railway Co., 107 Main St., 1 story, 100x130 ft., brick, steel shop, concrete found., Park and Grove Sts., day labor. Est. exceeds $37,000. L. E. Moore, 73 Tremont St., Boston, engr.

Mich., Bay City—BREWERY—Bay City Brewing Co., 2 story, basement, 50x60 ft., brick, stone, concrete tank storage building for brewery addition, plain found., to H. C. Weber Constr. Co., Bay City. Est. $40,000.

Mich., Detroit—PLANT—Belle Isle Lime Co., St. Jean and Belt Line R.R., 2 story, brick, steel, concrete and wood construction lime plant, for production of high calcium lime, plain found., St. Jean Ave., to Bennage & McKinstrie, 4612 Woodward St. Est. $50,000. Private plans.

Mich., Detroit—PLANT—Midland Steel Products Co., Mt. Elliot Ave., constructing brick, steel addition to steel products plant, to Barton-Malow Co., 1900 East Jefferson St. Est. $50,000.

Mich., Melvindale—REGULATOR BUILDING —Detroit City Gas Co., Clifford St., 1 story, brick, steel, concrete regulator building as part of gas plant, to Hazleton & Clark, 1038 Michigan Theatre Bldg. Est. $40,000. Private plans.

Mich., River Rouge—WAREHOUSE—American Malting Co., River Rouge, 2 story, brick, rein.-con. warehouse addition to malting plant, plain found., River Rouge, to George Constr. Co., 1919 Dime Bank Bldg., Detroit. Est. $50,000.

Mich., Saginaw—PLANT—Saginaw Steering Gear Co., 512 North Hamilton St., plant to C. M. St. John Co., 1840 Sheridan Ave. Est. about $37,000. Noted Mar. 5, C. D.—Mar. 12, E. N.-R.

Mo., St. Louis — PLANT — Fruin-Colnon Contg. Co., general contractors, 502 Merchants Laclede Bldg., roofing for 3 story, basement, 63x120 ft. office addition and 3 story, basement, 61x210 ft., brick, special products building, for Monsanto Chemical Co., 1700 South 2nd St., to Certain-teed Products Corp., 1531 North 11th St.***brick work, to C. G. Saenger, 3816 Fillmore St.***precast roofing slabs, to Federal American Cement Tile Co., Louderman Bldg.***sheet metal work, to Western Sheet Metal Wks., 4466 Finneyon St.***special products for Building C, to Boyd Bros. Steel Metal Wks., 3620 Laclede Bldg.***kalamein and tin clad doors, to Security Fire Door Co., 3044 Lambdin St.***painting, to J. Ward Painting Co., 3100 Easton St.***glass and glazing, to Pittsburgh Plate Glass Co., 3900 Chouteau Ave. ***plumbing, to Corrigan Co., 2501 West St. Louis St.***steel sash, to Lasar Mfg. Co., 1313 North 16th St. Noted Apr. 29, C. D.—May 7, E. N.-R.

Neb., Omaha—HOG HOUSE—Armour & Co., 30th and Q Sts., driving one thousand eight hundred 5 ft. piles for hog house, to Inland Constr. Co., 3867 Leavenworth St. Noted Mar. 26, C. D.—Apr. 2, E. N.-R.

Nev., Mountain City—ORE FLOTATION MILL —Mountain City Copper Co., constructing 300 ton capacity ore flotation mill, separate contracts. To exceed $50,000. Noted Jan. 14, C. D.—Jan. 16, E. N.-R.

N. J., Jersey City—LAUNDRY—Standard Laundry Co., 963 Garfield Ave., constructing laundry extension, to J. Mitchell, Inc., 575 Westside Ave., $58,000. R. G. & W. M. Cory, 30 Church St., New York, archts.

N. J., Jersey City—PLANT—Colgate-Palmolive-Peet Co., 105 Hudson St., 8 story plant on Green St., near York St., to Turner Constr. Co., 420 Lexington Ave., New York. Est. $185,000. Noted Dec. 4, C. D.—Dec. 12, E. N.-R.

N. J., Newark—WAREHOUSE—Continental Electric Co., 325 Ferry St., 1 story, basement, 50x150 ft. brick, concrete, storage warehouse, day labor. F. J. Walker, 4 Raymond Terrace, Maplewood, archt.

N. J., Paulsboro—STORAGE, etc.—Paterson Oil Terminal, Inc., constructing oil tanks and bulk storage, separate contracts awarded; steel, to Bethlehem Steel Co., Bethlehem, Pa. Est. exceeds $40,000.

N. Y., Dunkirk—FACTORY—Ludlum Steel Co., 66 Howard Ave., general contract factory, to Gillmore Carmichael & Olsen, 4300 Euclid Bldg., Cleveland, O. Est. $50,000. Noted Apr. 21, C. D.—Apr. 23, E. N.-R.

N. Y., Liberty — STORAGE, etc. — Markson Dairy Co., Jeffersonville, constructing large storage and garage, Main St., own forces. **Maturity soon.** Whitman S. Wick, 15 King St., Middletown, archt. W. Farnum, will supervise and purchase materials.

N. Y., Long Island City — PLANT — Acco Products, Inc., 24-02 39th Ave., constructing plant improvements, day labor. $37,000 with equipment. Private plans. Owner is purchasing equipment.

N. Y., Rochester—PLANT—Eastman Kodak Co., Kodak Park, Rochester, general contract 6 story, 62x140 ft. research laboratory, Kodak Park, to Ridge Constr. Corp., Kodak Park. Noted Apr. 22, C. D.

N. Y., Syracuse—CAR FACILITY BUILDING —New York Central R.R. Co., J. W. Pfau, ch. engr., 466 Lexington Ave., New York, constructing car facility building near new station, to Gorsline & Swan, 96 Peare St., Rochester, $114,180. General contractor awarded drop table and crane, to Whiting Corp., 157th St. and Lathrop Ave., Chicago, Ill.; steel sash, to Truscon Steel Co., Gurney Bldg. Noted Mar. 11, C. D.

O., Middletown—PLANT—Shartle Bros. Machine Co., plant addition, to F. K. Vaughn, Hamilton. Est. $50,000.

Pa., Farmers Valley — REFINERY — Quaker State Oil Refining Co., Chambers Bldg., Oil City, G. H. Hunter, genl. supt., alterations, additions and repairs to McKean refinery, incl. construction of new dewaxing plant, new boiler house and equipment and electrical generating equipment, 1,400 hp. high pressure boiler, feed water treating unit, to E. B. Badger Sons, New York.

Pa., McKees Rocks—FACTORY—Francisco & Jacobus, archts. and engrs., 511 5th Ave., New York, 3 story, basement, 120x120 ft., brick, steel, concrete, salt glazed terra cotta tile factory addition, Chambers St., to Hughes-Foulkrod Co., Schaff Bldg., Phila., for Enterprise Can Co., J. H. McGhee, in charge, Chambers St. Est. $85,000.

Wash., Camas—PLANT—Crown Willamette Paper Co., plant addition, to Austin Co., Dexter Horton Bldg., Seattle. Est. $80,000. Contractor awarded all separate contracts. Owner is now purchasing machinery and equipment.

Wash., Seattle — WAREHOUSE — Bethlehem Steel Co., Youngstown St., constructing 88x500 ft., steel, brick warehouse, West Spokane, company labor. $60,000.

★ **Wash., Tacoma**—PULP PLANT—St. Regis Kraft Co., 235 Park Ave., New York, remodeling, enlarging pulp plant, idle since 1930, and conversion for production bleached pulp, day labor. $1,000,000. S. H. Ferguson & Co., 200 Fifth Ave., New York, consult. engrs. Noted Nov. 20, C. D.—Nov. 28, E. N.-R.

Wis., Janesville—GARAGE—B. Vincent, general contract, constructing 1 story, part basement, 88x100 ft., brick, steel garage, to A. C. Olmstead, Janesville. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

Wis., Milwaukee—WAREHOUSE—Upholstering Sup. Co., 1033 North 4th St., general contract constructing 3 story, 25 x 50 ft. addition to warehouse, to Adam Schmitt & Son, 2771 North Cramer St.***carpentry, sheet metal, and roofing, to Wegner Builders, 4149 North 22nd St.***steel, to Skobis Co., 2545 North 30th St. ***steel sash, to Jackson & Fobey Co., 231 West Wisconsin Ave.***electrical work, to Knoerr & Fischer, 1015 North Milwaukee St. E. R. and C. Liebert, 1948 North Holton St., archts.

Wis., Neenah—WAREHOUSE—Kimberly Clark Corp., general contract constructing 5 story, brick, steel warehouse, to J. Leek, Green Bay, and 211 South 11th St., Minneapolis, Minn. Private plans.

Man., Winnipeg—STORAGE BINS—Canada Malting Co., 544 Grain Exchange Bldg., constructing rein.-con. annex, incl. 24 bins, 50x125x130 ft., to Carter Halls Aldinger Co., Royal Bank Bldg. Special grain handling equipment to be purchased. Noted Mar. 26, C. D.—Apr. 2, E. N.-R.

N. B., Dalhousie — TURBO-GENERATOR STEAM UNIT—Gatineau Power Co. Ltd., 140 Wellington St., Ottawa, Ont., constructing 10,000 hp. turbo-generator steam unit, day labor. $300,000. Generator will be purchased.

Ont., Leamington—POWER HOUSE—H. J. Heinz Co., H. O. Pittsburgh, Pa., constructing 65x75 ft., rein.-con., steel power house, to Piggott Constr. Co., Piggott Bldg., Hamilton. Noted May 1, C.D.

Ont., Trenton — FACTORY — Empire Foods Corp. Ltd., 159 Bay St., constructing 1 story, brick, steel boiler plant and factory alterations, plain found., Dufferin St. Owner builds. Est. $75,000. Boilers, setting, stokers, etc., to Taylor Eng. & Constr. Co. Ltd., 14 King St., Toronto. Noted Apr. 16, C. D.—Apr. 23, E. N.-R. under "Canada."

†Federal Government

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